Operating Manual
Axiostar
Transmitted-Light Microscope

ZEISS

Knowledge of this manual is required for the operation of the instrument. Therefore please make yourself familiar with the contents of this manual and pay special attention to hints concerning the safe operation of the instrument.

The specifications are subject to change; the manual is not covered by an update service.

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Issued by: **Carl Zeiss**
Light Microscopy

Postfach 4041
D-37030 Göttingen
Phone: ++49 551 5060 650
Telefax: ++49 551 5060 464
Internet: www.zeiss.de/micro
E-mail: micro@zeiss.de

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General notes on safety

Before starting-up the microscope please ensure you have familiarized yourself thoroughly with the contents of this manual.

Further information can be obtained from our service department or from authorized representatives.

The Axiostar microscope is an optical precision instrument which may be impaired in its performance or damaged if handled improperly.

The microscope must be operated by trained personnel only who must be aware of the possible danger involved with microscopy and the relevant application.

To ensure that the working procedure is safe and that the microscope functions without problems, the notes and warnings included in the operating instructions must be observed.

These are highlighted in the text by the following symbols:

CAUTION!

If the safety notes are not observed there is a risk for the user.

CAUTION!

Disconnect the instrument from the line.

CAUTION!

Hot surface; there is a risk of burns.

CAUTION!

If the safety notes are not observed there is a risk that the instrument will be destroyed.

NOTE!

Notes which must be observed when working with the microscope.

Instrument Safety and EMC

The Axiostar microscope was designed, produced and tested in compliance with DIN EN 61010-1 (IEC 1010-1) *„Safety requirements for electrical measuring, control and laboratory instruments"*. It left the factory in a perfectly safe condition.
The Axiostar microscope meets the requirements of the EC directives 73/23/EC-appendix 1 and 89/336/EC and the EMC legislation of 09.11.1992:

Radio interference is suppressed in accordance with EN 55011 class B

Resistant to jamming in accordance with EN 50082-2

Conformity with the above EC directives is documented by the CE symbol.

Unpacking, transport, storage

Please observe the following safety notes when unpacking, transporting and storing the Axiostar microscope:

- In accordance with standard practice the microscope is supplied in a plastic container with cardboard packaging; only use the original packaging for transport.
- Retain the packaging for longer storage periods or return of the instrument to the manufacturer.
- When unpacking use the delivery note to ensure that all configurations and modules are present.

- Observe transport and storage temperatures in accordance with the technical data.
- Place the microscope on a stable work bench.
- Keep optical surfaces free of finger prints.

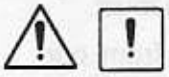
Disposal

When disposing of the Axiostar microscope please observe the following safety notes:

- Defective microscopes do not belong with domestic waste;
  they should be disposed of in the original packaging and in accordance with the relevant statutory provisions.
- If in doubt please contact the Carl Zeiss Microscopy Service.

Operation

Please observe the following safety notes when using the Axiostar microscope:



- The microscope can be operated with a line voltage of 100 – 240 V
- The microscope must only be connected to a properly installed socket featuring a grounding contact; the grounding effect must not be made ineffective by an extension cable which does not have a protective ground wire.
- If it is established that the protection measures are no longer effective:
  ⇒ switch off the microscope
  ⇒ safeguard against inadvertent operation
  ⇒ contact an authorized workshop or the manufacturer to have repairs carried out.

- Always disconnect the instrument from the line before opening the instrument, changing the lamps or changing the fuses!
- Only use fuses for the required rated power!
- The use of makeshift fuses and the short-circuiting of the fuse holders are not permitted!

Be careful of light-emitting diode radiation when using the LED illuminator. Do not look directly into the illuminator with your naked eyes from a short distance. When adjustments are required, the intensity must be reduced accordingly via the potentiometer, or a suitable attenuator must be used.

Care and maintenance

Please observe the following safety notes when caring for and maintaining the Axiostar microscope:

- With the exception of the work specified in *Chapter 4* of this manual *„Care, maintenance and Troubleshooting"*, no maintenance or repair may be performed by the user. We expressly point out that any other repairs must only be carried out by our authorized personnel.
- Damaged instruments or components must only be repaired and maintained by our service department.

- Protect the microscope against dirt, dust and moisture; these influences can impair the performance of the instrument.
- If the microscope is not in use, protect it using the dust cover; make sure that it has been switched off.

- Lamps are to be changed in accordance with the steps in *Chapter 4 „Care, Maintenance and Troubleshooting"*.
- Disconnect the instrument from the line before changing a lamp.
- Let the lamps cool down before changing them.
- Keep the lamps free of finger prints.

Notes on warranty

The Axiostar microscope, including its original accessories, may only be used for the microscope techniques described in this manual. The manufacturer cannot assume any liability for any other applications.

Please observe the following warranty notes for the Axiostar microscope:

- The manufacturer guarantees that the instrument has no material and production defects when delivered.
- You must inform us of any defects immediately and do everything possible to minimize the damage.
- If the manufacturer is informed of such a defect he is obliged to remove it.; it is his decision whether he does this by repairing the instrument or by delivering an instrument free of any defect.
- No guarantee is provided for defects caused by natural wear (wearing parts in particular) or improper use.
- The manufacturer is not liable for damage caused by faulty operation, negligence or any other tampering with the instrument, in particular as a result of removing and exchanging microscope components or the use of accessories from other manufacturers.
- Unauthorized intervention invalidates all claims against the warranty.

INSTRUMENT DESCRIPTION

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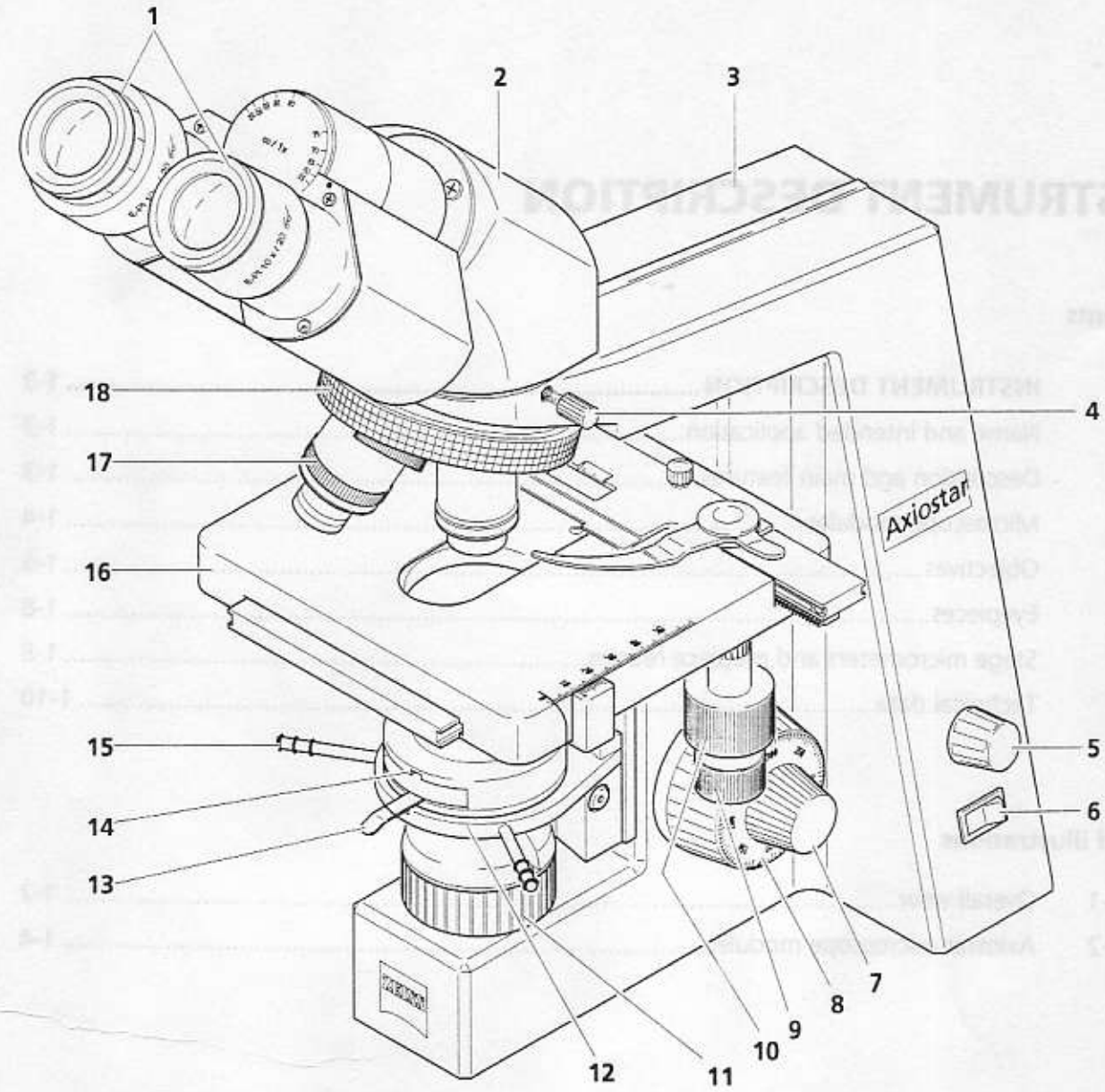


Fig. 1-1 Overall view

1 INSTRUMENT DESCRIPTION

1.1 Name and intended application

Manufacturer's name:
Axiostar microscope

The Axiostar is a transmitted light microscope for the visualization of fine structures and forms in biology and medicine. Typical applications of the Axiostar include

- laboratory microscopy,
- doctors' offices,
- training (schools and universities).

Key to fig. 1-1

1 Eyepieces
2 Binocular tube
3 Microscope stand
4 Knurled screw for tube locking
5 Brightness control
6 On/off switch with integrated signal lamp
7 Fine focusing drive (two-way)
8 Coarse focusing drive (two-way)
9 Drive for adjusting mechanical stage in X direction
10 Drive for adjusting mechanical stage in Y direction
11 Luminous field diaphragm
12 Condenser carrier
13 Lever for adjusting aperture diaphragm
14 Condenser
15 Centering screw for condenser (two-way)
16 Mechanical stage with specimen holder
17 Objective
18 4 or 5-position nosepiece

1.2 Description and main features

Thanks to its pyramid design, the Axiostar is a compact transmitted-light microscope.

In addition to high-resolution ICS objectives and the major brightfield, darkfield, phase contrast and polarization contrast techniques, an optional camera port for photo and video documentation is also available to the user.

Major instrument features:

- Sturdy and convenient stand in the pyramid design
- User-friendly coaxial coarse and fine drive
- Mechanical stage 75 × 30 R with ceramic-coated stage surface and specimen holder
- Space-saving and continuously adjustable integrated illuminator with long-life 6 V, 20 W halogen lamp
- 0.9/1.25 condenser for brightfield, darkfield and phase contrast Ph 1, 2, 3
- Ball-bearing, 4- or 5-position nosepiece with W 0.8 thread
- ICS objectives in the price/performance categories CP-Achromat, A-Plan and Achroplan in finely graduated rows
- Binocular tube 45°/20 ICS with a viewing height of 425 – 470 mm and binocular phototube 45°/20 ICS with folding prism 100% vis / 100% doc
- 10× eyepieces for the field numbers 20 or 18, suitable for eyeglass wearers, fixed and adjustable

1.3 Microscope modules

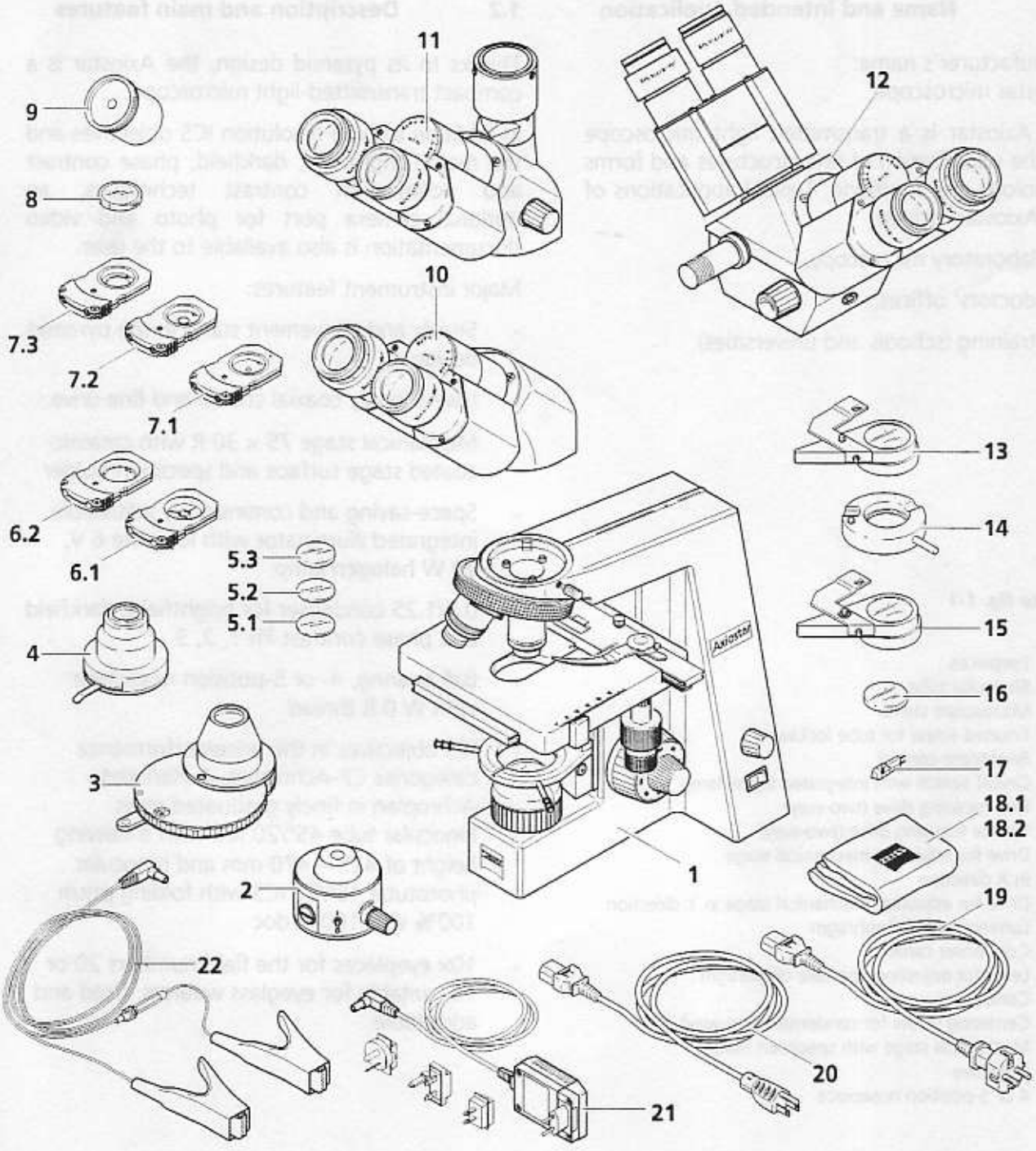


Fig. 1-2 Axiostar microscope modules

	Axiostar Microscope Configurations and Modules	Cat. No.
1	„Axiostar" microscope stand with 4-position nosepiece W 0.8, power supply 100 ... 240 V/50 ... 60 Hz/65 VA, mechanical stage 75 × 30 R with ceramic surface, specimen holder with spring clip R, condenser carrier with drive, luminous field diaphragm with iris, long-life 6 V, 20 W halogen lamp, line cable	000000-1122-100
not shown	„Axiostar" microscope stand with 5-position nosepiece W 0.8, power supply 100 ... 240 V/50 ... 60 Hz/65 VA, mechanical stage 75 × 30 R with ceramic surface, specimen holder with spring clip R, condenser carrier with drive, luminous field diaphragm with iris, long-life 6 V, 20 W halogen lamp, line cable	000000-1112-098
2	LED illuminator for Axiostar	000000-1069-919
3	Abbe condenser with 5-position turret	000000-1092-585
4	Abbe condenser 0.9/1.25	000000-1029-023
5.1	Conversion filter CB 3, d = 32 × 2 mm	467852-0000-000
5.2	Conversion filter CB 12, d = 32 × 2 mm	467850 9901-000
5.3	Interference wide-band filter green, d = 32 × 4 mm	467803-0000-000
6.1	Slider for darkfield 0.25/0.9	000000-1037-994
6.2	Slider for darkfield 0.65/0.9	000000-1037-995
7.1	Slider for Ph 1	000000-1037-992
7.2	Slider for Ph 2	000000-1033-187
7.3	Slider for Ph 3	000000-1037-993
8	Analyzer for screwing into the tube	000000-1059-241
9	Diopter d = 30 mm	444020-0000-000
10	Binocular tube 45°/20 ICS	452928-0000-000
11	Binocular phototube 45°/20 ICS (100% vis / 100% doc)	000000-1097-701
12	Double tube ICS with pointer and power unit	000000-1013-262
13	Wide-angle unit	445312-0000-000
14	Color filter carrier	451834-0000-000
15	Swing-in polarizer	453617-0000-000
16	Polarization filter 32 mm	473600-0000-000
17	Long-life 6 V, 20 W halogen lamp (spare lamp)	380079-9690-000
18.1	Dust cover K	459300-0000-000
18.2	Dust cover G (if binocular phototube is used)	459306-0000-000
19	Line cable with European plug	
20	Line cable with American flat plug	
21	Separate power unit 12 V, 1.25 A	000000-1103-709
22	12V battery adapter cable, 4m long	000000-0426-575
not shown	Container for Axiostar	000000-1027-042

1.4 Objectives

The objectives are the optical centerpiece of the microscope.
The following is an example of how objectives can be labeled:

CP-ACHROMAT 10×/0.25 ∞/-.

where:

10× = objective magnification, with a defined color ring on the objective being allocated to each magnification step (Carl Zeiss color code)

0.25 = numerical aperture

∞ = infinite tube length

– = can be used with cover slip thickness D = 0 or 0.17 mm

or

0.17 = can be used with cover slip thickness D = 0.17 mm

and

Oil = oil immersion objective

Ph 2 = phase contrast objective with green objective labeling and annular diaphragm Ph 2

The objective magnification multiplied by the eyepiece magnification (usually 10×) results in the visual overall magnification:
e. g. 10 × 10 = 100×.

The numerical aperture × 1000,
e. g. 0.25 × 1000 = 250×, is the highest useful magnification, i.e. no further details are resolved above that limit.

☞
The objective labeling "∞" indicates that these objectives may only be used with microscopes featuring an infinite tube length and not with instruments whose objectives are marked with "160" as their mechanical tube length.

The exact observance of the cover slip thickness of 0.17 mm is all the more necessary the higher the numerical aperture of the objective. Therefore, so-called "Corr" objectives can be set for different cover slip thicknesses via a correction ring. For this, a specimen area is searched, and the position of the correction ring where optimum focus and image contrast are obtained is determined (refocusing is always required).

Immersion objectives are always insensitive to differences in cover slip thickness.

When immersion objectives are used, the air between the cover slip and the objective is replaced with a liquid, which is immersion oil in most cases. The plastic oiler containing 20 ml of 581 N Immersol is particularly suitable for this purpose.

Due to their short working distance, objectives 25× and higher feature resilient mounts (specimen protection).

The following objectives are available for the Axiostar microscope:

Microscopy Technique	Objective	Magnification/ Numerical Aperture	Free working distance FAA [mm]	Cover slip thickness D [mm]	Cat.No.
Transm.-light brightfield	CP-Achromat	5x/0.12	11.2	-	440920-0000-000
	CP-Achromat	10x/0.25	5.1	-	440930-0000-000
	CP-Achromat	40x/0.65	0.3	0.17	440950-0000-000
	CP-Achromat	100x/1.25 Oil	0.07	0.17	440980-0000-000
Phase contrast	CP-Achromat	10x/0.25 Ph 1	5.1	-	440931-0000-000
	CP-Achromat	40x/065 Ph 2	0.3	0.17	440951-0000-000
	CP-Achromat	100x/1.25 Oil Ph 2	0.07	0.17	000000-1007-159
	CP-Achromat	100x/1.25 Oil Ph 3	0.07	0.17	440981-0000-000
Transm.-light brightfield	A-Plan	5x/0.12	9.9	-	441020-0000-000
	A-Plan	10x/0.25	4.4	-	441030-0000-000
	A-Plan	20x/0.45	0.53	0.17	441040-0000-000
	A-Plan	40x/0.65	0.43	0.17	441050-0000-000
	A-Plan	100x/1.25 Oil	0.22	0.17	441080-0000-000
Phase contrast	A-Plan	10x/0.25 Ph 1	4.4	-	441031-0000-000
	A-Plan	20x/0.45 Ph 2	0.53	0.17	441041-0000-000
	A-Plan	40x/0.65 Ph 2	0.43	0.17	441051-0000-000
	A-Plan	100x/1.25 Oil Ph 3	0.22	0.17	441081-0000-000
Transm.-light brightfield	Achroplan	4x/0.10	11.1	-	440020-0000-000
	Achroplan	10x/0.25	4.8	-	440030-0000-000
	Achroplan	20x/0.45	2.07	0.17	440040-0000-000
	Achroplan	40x/0.65	0.59	0.17	440050-0000-000
	Achroplan	50x/0.90 Oil	0.29	0.17	440057-0000-000
	Achroplan	63x/0.80	0.29	0.17	440060-0000-000
	Achroplan	63x/0.95	0.15	0 (no cover slip)	440068-0000-000
	Achroplan	100x/1.25 Oil	0.19	0.17	440080-0000-000
	Achroplan	100x/1.25 Oil Iris	0.19	0.17	440086-0000-000
Phase contrast	Achroplan	10x/0.25 Ph 1	4.8	-	440031-0000-000
	Achroplan	20x/0.45 Ph 2	2.07	0.17	440041-0000-000
	Achroplan	40x/0.65 Ph 2	0.59	0.17	440051-0000-000
	Achroplan	100x/1.25 Oil Ph 3	0.19	0.17	440081-0000-000
Transm.-light brightfield	Plan-Neofluar	2.5x/0.075	9.3	-	440310-0000-000

1.5 Eyepieces

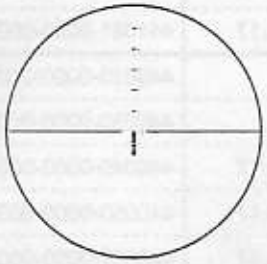
The following eyepieces are offered for the Axiostar:

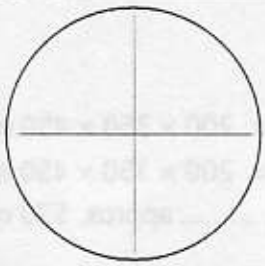
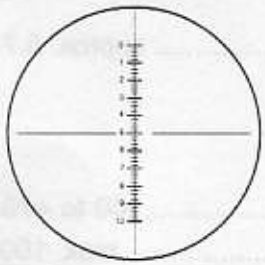
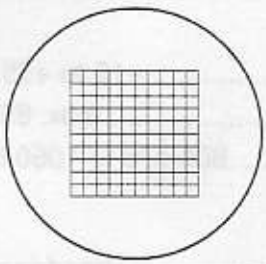
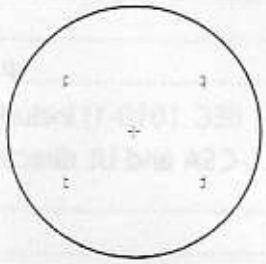
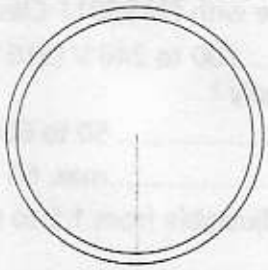
Eyepiece	Image angle	Cat. No.
Eyepiece PL 10×/18 Br.	39°	444131-9901-000
Eyepiece PL 10×/18 Br. foc.	39°	444132-9901-000
Eyepiece E-PL 10×/20 Br.	43°	444231-9901-000
Eyepiece E-PL 10×/20 Br. foc.	43°	444232-9902-000
Eyepiece PL 16×/16 Br.	54°	444053-0000-000
Eyepiece PL 16×/16 Br. foc.	54°	444054-0000-000

If required, eyecups for the eyepieces can be ordered under Cat. No. 444801-0000-000.

1.6 Stage micrometers and eyepiece reticles

Measuring and counting using the microscope requires stage micrometers and eyepiece reticles, a small selection of which is listed below:

Illustration	Description, Technical Data	Cat. No.
	**Stage micrometer, positive 5 + 100/100 y** D = 0.17 mm gradation on the +y-axis: 5 mm in 5 intervals; gradation on the –y-axis: 1 mm in 100 intervals with two opposing scales = 10 µm Accuracy ±1 µm	474026-0000-000
	Crossline micrometer disk 14:140 / d = 26 mm gradation length = 14 mm increments = 0.1 mm gradation tolerance ≤ 0.001 mm	454060-0000-000

	**Crossline disk / d = 26 mm**	474064-0000-000
	**Crossline micrometer disk 10:100 / d = 26 mm** gradation length = 10 mm increments = 0.1 mm gradation tolerance ≤ 0.001 mm	474066-9901-000
	**Net micrometer 12.5×12.5/5;10 / d = 26 mm** area 12.5 × 12.5 mm, divided in fields of 5 × 5 or 10 × 10	474068-0000-000
	**Photo reticle MC 2.5× / d = 26 mm** for 35mm photography with an additional magnification of 2.5× or for large-format photography with a 10× additional magnification	454075-0000-000
	**Fixed pointer for focusing eyepiece / d = 26 mm** To point toward objects in the specimen	000000-1095-418

☞ If an eyepiece reticle is used, the binocular tube or the phototube must be equipped with two foc. eyepieces containing an adjustable eyelens, into one of which the eyepiece reticle is mounted.

1.7 Technical data

(1) Dimensions (width × depth × height)

Stand with binocular tube ..... approx. 200 × 350 × 450 mm
Stand with phototube ..... approx. 200 × 350 × 450 mm
Overall height including T2 adapter and CONTAX ARIA SLR camera housing ..... approx. 570 mm

(2) Weight

Axiostar with binocular tube ..... approx. 6.7 kg

(3) Ambient conditions

Storage and transport (in packaging):

Permissible ambient temperature ..... -40 to +70 °C
Permissible relative humidity (without condensation) ..... max. 100 %

Operation:

Permissible ambient temperature ..... +10 to +35 °C
Permissible relative humidity (without condensation) ..... max. 85 %
Air pressure ..... 800 hPa to 1060 hPa

(4) Operating data

Category of use ..... closed rooms
Protection class I
Protection type ..... IP 20
Electrical safety ..... in compliance with DIN EN 61010-1 (IEC 1010-1) including ..... CSA and UL directives
Pollution degree 2
Excess voltage category II
Radio interference suppression ..... in accordance with EN 55011 Class B
Line voltage ..... 100 to 240 V (±10 %)
Conversion of the voltage is not necessary by using the wide range power supply !
Line frequency ..... 50 to 60 Hz
Power consumption. ..... max. 65 VA
Output voltage ..... stabilized, adjustable from 1.5 to 6 V

(5) Fuses in accordance with IEC 127

for 100 – 240 V ..... T 0.8 A; 250 V; 5 × 20 mm

(6) Light source

Halogen lamp ..... HAL 6 V, 20 W
Adjustment of the light source ..... continuous, 1.5 to 6 V DC

Color temperature at 6 V ..... 2800 K [1]
Light flux ..... 280 lm
Average life ..... 1000 h
Luminous area ..... 2.0 × 2.0 mm

(7) Opto-mechanical data

Stand with stage focusing ..... with coarse drive [2] (4 mm/U)
..... and fine drive (0.4 mm/U)
..... overall lift 15 mm
Objective change ..... manually via 4/5-position nosepiece
Objectives ..... ICS line of objectives with W 0.8 thread
Eyepieces ..... 30 mm plug-in diameter
with field number 18 ..... PL 10×/18 Br. and PL 10×/18 Br. foc. or
with field number 20 ..... E- PL 10×/20 Br. and E- PL 10×/20 Br. foc.
Specimen stage ..... mechanical stage 75 × 30 R with ceramic surface
Dimensions (width × depth) ..... 160 × 140 mm
Travel range (width × depth) ..... 75 × 30 mm
Specimen holder ..... with spring clip to the right for one-handed operation
Abbe-condenser 0.9/1.25 ..... for $V_{Obj.}$ < 4× with wide angle function 445312-0000-000
Binocular tube 45°/20 ;
maximum field number 20
interpupillary distance ..... can be set between 55 and 75 mm
viewing angle ..... 45°
viewing height ..... 425 – 470 mm
visual port ..... tube factor 1×
Binocular phototube 45°/20 ;
maximum field number 20
interpupillary distance ..... can be set between 55 and 75 mm
viewing angle ..... 45°
viewing height ..... 425 – 470 mm
visual port ..... tube factor 1×
camera/video port ..... tube factor 1×
camera/video port ..... interface 60 mm
switched via folding prism ..... 100% vis / 100% doc

[1] For photography using artificial light color reversal film for 3200 K, the conversion filter CB 3 (467852) produces the correct color temperature in the light path.

[2] The scale on the coarse drive (0 to 400) permits the orienting measurement of the object thickness:
1 increment corresponds to approx. 5 µm

START-UP

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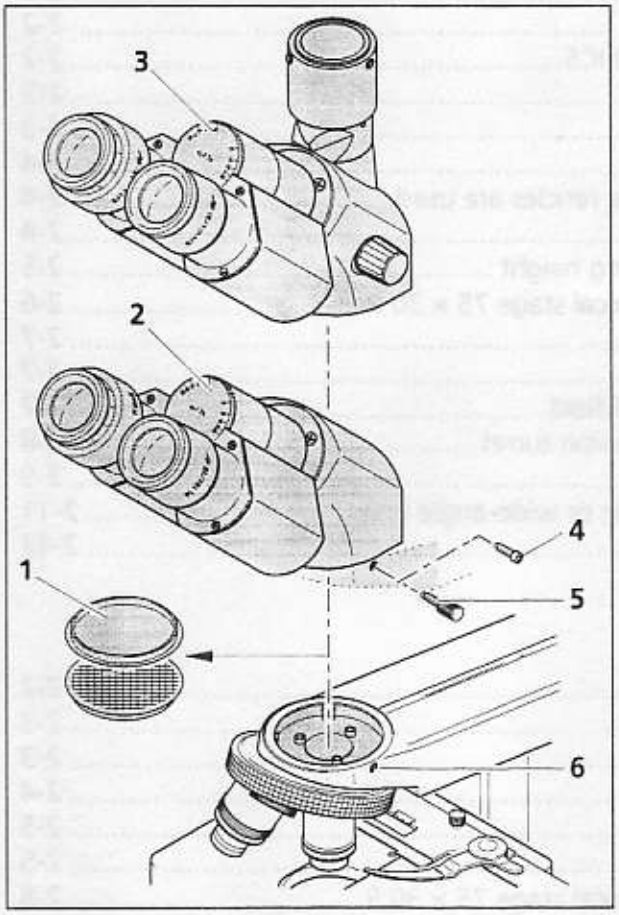
2 START-UP

☞

Before installing and starting-up the Axiostar, carefully read through and observe the notes on safety (page *V ff.*).

!

To prevent finger prints, do not touch optical surfaces when unpacking!



1 Dust cap
2 Binocular tube
3 Binocular phototube
4 Hexagonal screw
5 Knurled screw
6 Threaded hole for knurled or hexagonal screw

Fig. 2-1 Attachment of binocular tube/phototube

2.1 Unpacking the instrument

The Axiostar microscope, including accessories, is delivered in standard packaging.

- Remove the microscope from the transport case and place it on the work table.
- Keep the packaging so that the instrument can be stored for a longer period of time or returned to the manufacturer.

2.2 Attachment of tube

One knurled screw and one hexagonal screw each are supplied for the binocular tube (phototube) 45°/20 ICS. Any of these screws can be used to clamp the tube (phototube) to the stand.

- Screw the required screw into the threaded hole (2-1/**6**) in the stand.

2.2.1 Attachment of binocular tube 45°/20 ICS

- Remove dust covers (2-1/**1**) from tube underside and the dovetail mount on the stand by unscrewing the knurled screw (2-1/**5**) or the hexagonal screw (2-1/**4**) from the stand.
- Hold the binocular tube (2-1/**2**) in a slightly inclined position to the left, attach it to the stand mount via the dovetail and turn it to the required observation position; both the illustrated rotation and the 180° backward rotation are possible.
- Tighten the knurled screw (2-1/**5**) or the hexagonal screw (2-1/**4**).

2.2.2 Attachment of binocular phototube 45°/20 ICS

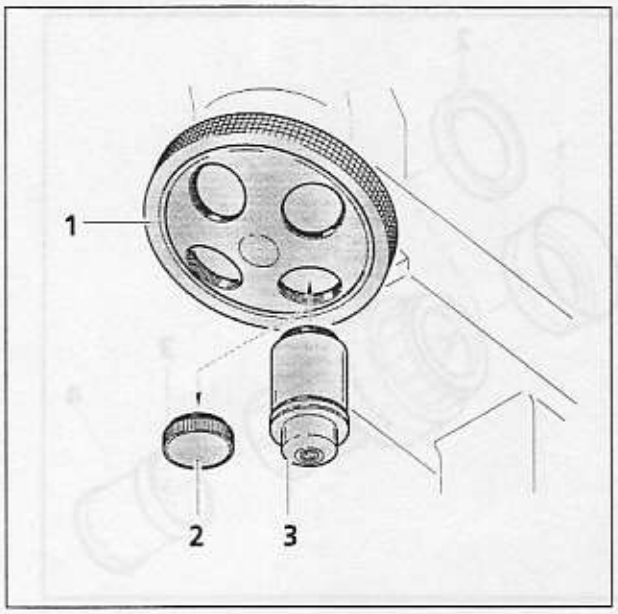
- Remove dust caps (2-1/**1**); loosen knurled screw (2-1/**5**) or hexagonal screw (2-1/**4**).
- Attach the binocular phototube (2-1/**3**) to the stand mount in the same way as the binocular tube.
- Tighten knurled screw (2-1/**5**) or hexagonal screw (2-1/**4**).

2.3 Screwing-in of objectives

- Remove dustcaps (2-2/**2**) according to the number of objectives and screw objectives (2-2/**3**) into nosepiece (2-2/**1**) clockwise one by one, starting with the lowest magnification.

☞

The dust caps should remain on those nosepiece eyes which are not required.



1 4 or 5-position nosepiece
2 Dust cap
3 Objective

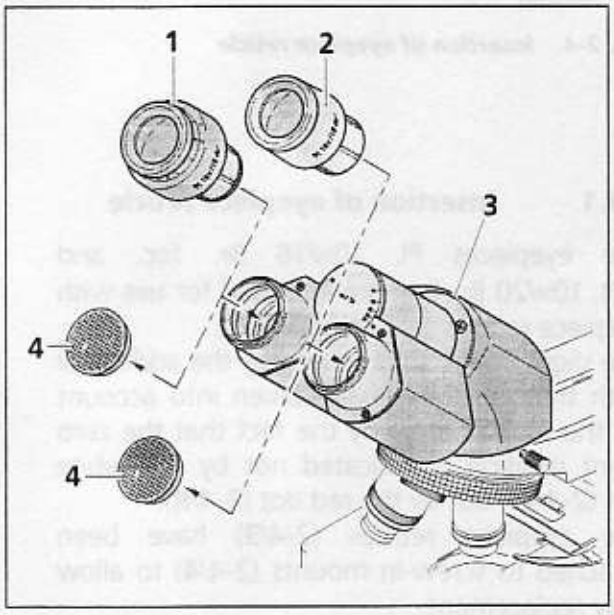
Fig. 2-2 Screwing-in of objectives

2.4 Insertion of eyepieces

- Remove both protection caps (2-3/**4**) from the binocular tube (2-3/**3**).
- Insert the fixed eyepiece, e. g. PL 10×/18 Br. (2-3/**2**), into the right tube and the focusing eyepiece PL 10×/18 Br. foc. (2-3/**1**) into the left tube.

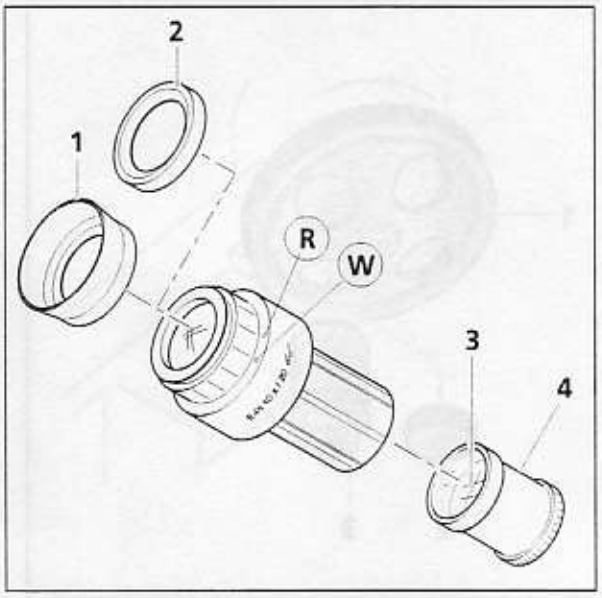
☞

The focusing eyepiece is used to compensate for ametropia of the eyes.



1 Focusing eyepiece
2 Fixed eyepiece
3 Binocular tube
4 Dust caps

Fig. 2-3 Insertion of eyepieces



R Zero point position of diopter scale with eyepiece reticle
W Zero point position of diopter scale without eyepiece reticle
1 Eyecup
2 Spectacle protection ring
3 Eyepiece reticle
4 Mount

Fig. 2-4 Insertion of eyepiece reticle

2.4.1 Insertion of eyepiece reticle

The eyepieces PL 10×/18 Br. foc. and E-PL 10×/20 Br. foc. are intended for use with eyepiece reticles *(see chapter 1.6)*.
The slight image shift caused by the additional path through the glass is taken into account on the diopter scale by the fact that the zero point position is indicated not by the white dot (2-4/**W**) but by the red dot (2-4/**R**).
The eyepiece reticles (2-4/**3**) have been attached to screw-in mounts (2-4/**4**) to allow easy replacement:

- Unscrew the mount containing the eyepiece reticle from the eyepiece.
- Screw in the new mount containing the required eyepiece reticle.

2.4.2 Compensation of ametropia when eyepiece reticles are used

The correct use of an eyepiece reticle requires two focusing eyepieces, e. g. PL 10×/18 Br. foc., to make it possible to compensate for possible ametropia of the observer's eyes.

- Use the eyelens of the focusing eyepiece to focus on the line figure of the eyepiece reticle.
- Focus on the microscope image of a specimen via the focusing drive by looking through the eyepiece with reticle.

When the image and the eyepiece reticle are in focus in this eyepiece, focus the image for the second eye via the focusing eyelens of the second eyepiece.

☞

If the image is focused for the second eye using the focusing eyelens, the position of the focusing drive on the stand must not be changed.

2.4.3 Attachment of folding eyecups

The eyepieces are equipped with rubber rings to protect the spectacles from scratches. These rings can be replaced with folding eyecups, if wanted.

- Remove the rubber rings (2-4/**2**) from the eyepieces and attach the eyecups (2-4/**1**).

Sometimes, the spectacle protection rings fit very tightly in the eyepiece groove so that a dull object (e.g. tooth pick) is required to press them out.

2.5 Setting of interpupillary distance and viewing height

- The eyepiece distance is matched to the individual interpupillary distance of the observer by swinging the eyepiece tubes symmetrically towards one another (2-5).

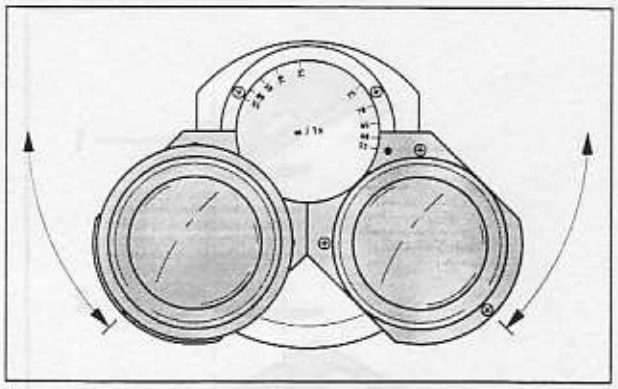


Fig. 2-5 **Setting of interpupillary distance**

- The viewing height is matched to the requirements of the individual user by swinging the eyepiece tubes upwards (2-6/**A**) or downwards (2-6/**B**).

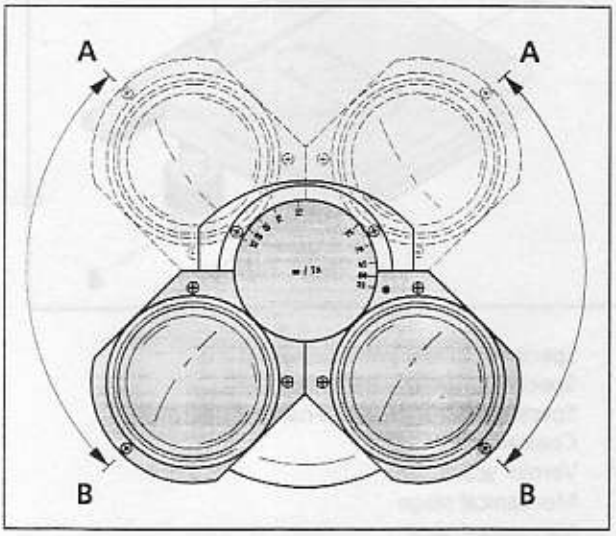
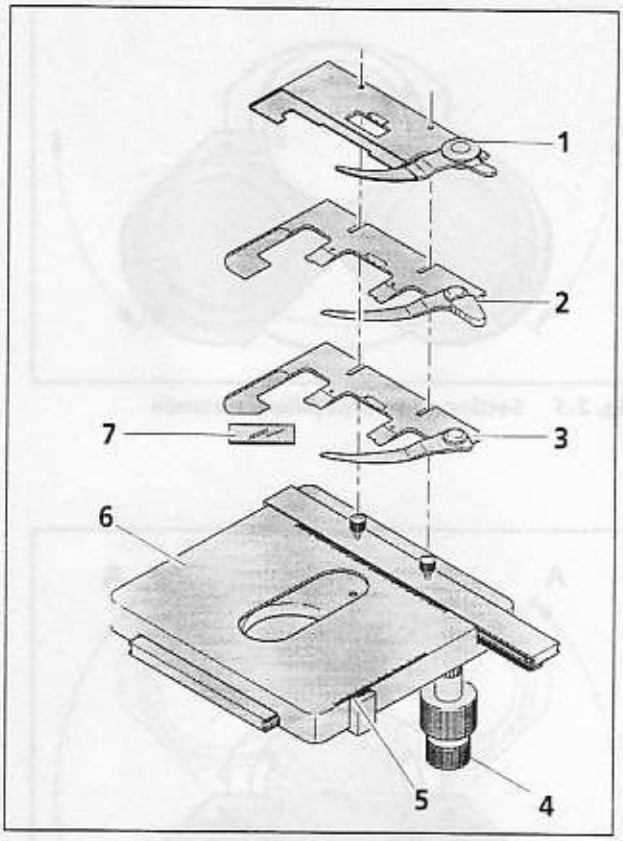


Fig. 2-6 *Setting of viewing height*



1 Specimen holder with spring clip
2 Specimen holder with spring clip
3 Specimen holder for one-handed operation
4 Coaxial drive
5 Vernier scales
6 Mechanical stage
7 Microscope slide

Fig. 2-7 Attachment of specimen holder to mechanical stage 75 x 30 R

2.6 Attachment of specimen holder to mechanical stage 75 x 30 R

The Axiostar microscope stand features the mechanical stage 75 x 30 R with ceramic coating (2-7/**6**).

The specimen is precisely moved in x and y using the coaxial drive (2-7/**4**).

The x/y gradation on the stage surface (2-7/**5**) with the two vernier scales helps to relocate certain specimen spots.

The readily mounted specimen holder with spring clip R (453536-0000-000) (2-7/**1**) is part of the standard configuration.

As an alternative it is also possible to use

- the specimen holder with spring clip R (473448-0000-000) (2-7/**2**)

or

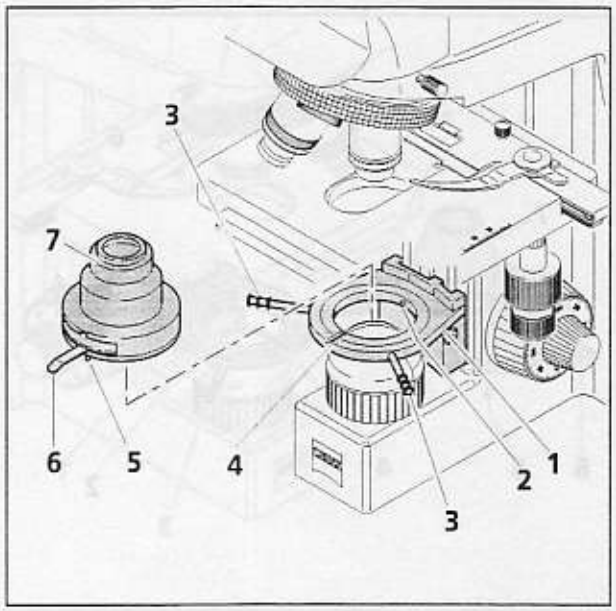
- the specimen holder for one-handed operation (453548-0000-000) (2-7/**3**).

- Here, the microscope slide (2-7/**7**) is inserted into the specimen holder along the guiding edge, the spring clip is swung out and will automatically clamp the microscope slide in its stop position.
- The specimen holders can be easily exchanged in the x-direction using the two fixing screws on the guiding rail.
- Loosen the two fixing screws, pull out specimen holder to the front and insert new specimen holder until it engages in the guiding slots. Tighten the two fixing screws again.

2.7 Attachment of condensers

2.7.1 Attachment of Abbe condenser 0.9/1.25

- Unscrew both centering screws (2-8/**3**) on the condenser carrier (2-8/**1**) until the Abbe condenser 0.9/1.25 (2-8/**7**) can be easily inserted into the condenser carrier.
- Insert the condenser into the condenser carrier in such a way that
  1. the dovetail of the condenser is pressed against the spring pin (2-8/**2**) in the condenser carrier and
  2. the orientation screw (2-8/**5**) on the underside of the condenser enters the groove (2-8/**4**) on the condenser carrier.
- Tighten both centering screws (2-8/**3**) on the condenser carrier (2-8/**1**) until they engage in the dovetail and keep the condenser (2-8/**7**) in position.

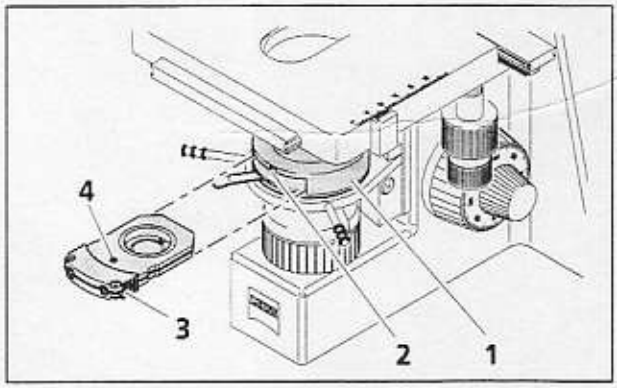


1 Condenser carrier
2 Spring pin
3 Centering screws
4 Groove
5 Orientation screw
6 Aperture diaphragm lever
7 Condenser

Fig. 2-8 Attachment of Abbe condenser 0.9/1.25

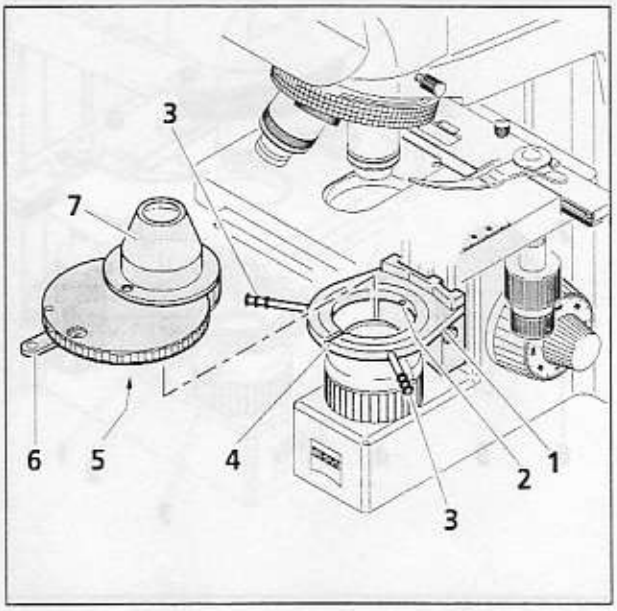
2.7.2 Insertion of slider for phase contrast or darkfield

- Insert the slider (2-9/**3**) until it engages in the opening in the condenser (2-9/**1**); the orientation screw (2-9/**4**) must face upwards and engage in the guiding slot (2-9/**2**).



1 Condenser
2 Guiding slot
3 Slider for phase contrast or darkfield
4 Orientation screw

Fig. 2-9 Insertion of slider for phase contrast or darkfield



1 Condenser carrier
2 Spring pin
3 Centering screws
4 Groove
5 Orientation screw
6 Aperture diaphragm lever
7 Condenser

Fig. 2-10 Attachment of Abbe condenser with 5-position turret

2.7.3 Attachment of Abbe condenser with 5-position turret

Attachment is made in the same way as that of the Abbe condenser 0.9/1.25.

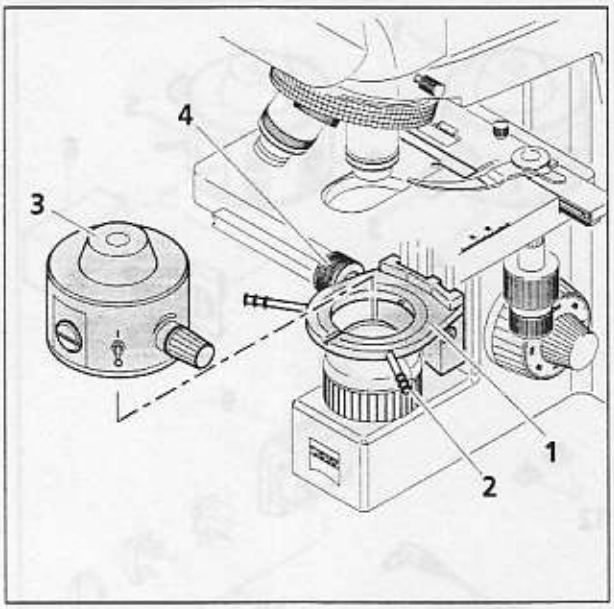
- Loosen both centering screws (2-10/**3**) on the condenser carrier (2-10/**1**).
- Press condenser with dovetail against the spring pin (2-10/**2**) in the condenser carrier. Make sure that the orientation screw (2-10/**5**) on the condenser engages in the groove (2-10/**4**) of the condenser carrier.
- Tighten both centering screws (2-10/**3**) on the condenser carrier (2-10/**1**) until they engage in the dovetail and hold the condenser (2-10/**7**) in position.

2.7.4 Attachment of LED illuminator

- Insert LED illuminator (2-11/**3**) in the condenser carrier (2-11/**1**) in the same way as the Abbe condensers.
- Tighten both centering screws (2-11/**2**) until the LED illuminator lies approximately in the center of the beam path.
- Use condenser drive (2-11/**4**) to move the condenser carrier into the topmost position.

Power to the LED illuminator can be supplied either via the line power unit or, independent of the line, via a commercially available 9 V Alkaline battery (9 V / Ni Cd battery block) in the integrated battery compartment, or via an external voltage source ranging from 11 to 14 V DC (e.g. 12 V car battery). The external voltage source must permit a constant current of up to approx. 120 mA to be loaded.

The LED illuminator provides pleasant, color-neutral white light with a constant color temperature independent of the set brightness. It is suitable for objectives ranging from 2.5x to 100x. The light-emitting diodes have a long life and cause only minor operating costs.



1 Condenser carrier
2 Centering screw
3 LED illuminator
4 Condenser drive

Fig. 2-11 Attachment of LED illuminator

Operation with power unit

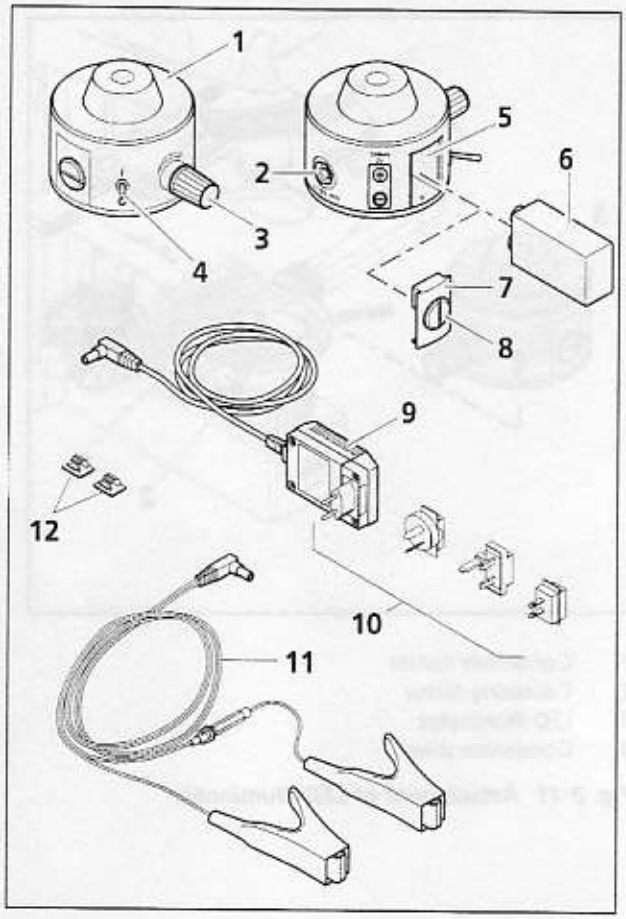
- Insert country-specific adapter (2-12/**10**) into the power unit (2-12/**9**).
- Insert angled connector of the power unit (2-12/**9**) into the +12 V socket (2-12/**2**) of the LED illuminator (2-12/**1**).
- Connect power unit to the line.

☞

The operation life with battery operation strongly depends on the set brightness and the loading capacity of the battery.

⚠

Be careful of light-emitting diode radiation when using the LED illuminator. Do not look directly into the illuminator with your naked eyes from a short distance. When adjustments are required, the intensity must be reduced accordingly via the potentiometer, or a suitable attenuator must be used.



1 LED illuminator
2 +12 V socket
3 Control
4 Toggle switch
5 Battery compartment
6 9 V Alkaline battery
7 Cover
8 Holding screw
9 Power unit
10 Country-specific adapter
11 12 V battery-adapter cable (4 m long)
12 Cable holder

Fig. 2-12 Connection of LED illuminator to power source

Operation with 9 V Alkaline battery (9 V / Ni Cd battery block)

- Turn holding screw (2-12/**8**) on the cover (2-12/**7**) of the battery compartment to the left and remove the cover.
- Insert 9 V Alkaline battery (2-12/**6**) into the battery compartment (2-12/**5**) with the terminals in front (plus pole points upwards).
- Attach cover, press it on and fix it in position by turning the holding screw to the right.

Operation with external voltage supply

- Insert angled connector of the 12 V battery-adapter cable (2-12/**11**) into the +12 V socket (2-12/**2**) of the LED illuminator.
- Connect cable clamps of the 12 V battery-adapter cable (2-12/**11**) to the used 12 V battery:
  red clamp to plus pole (+),
  black clamp to minus pole (-).

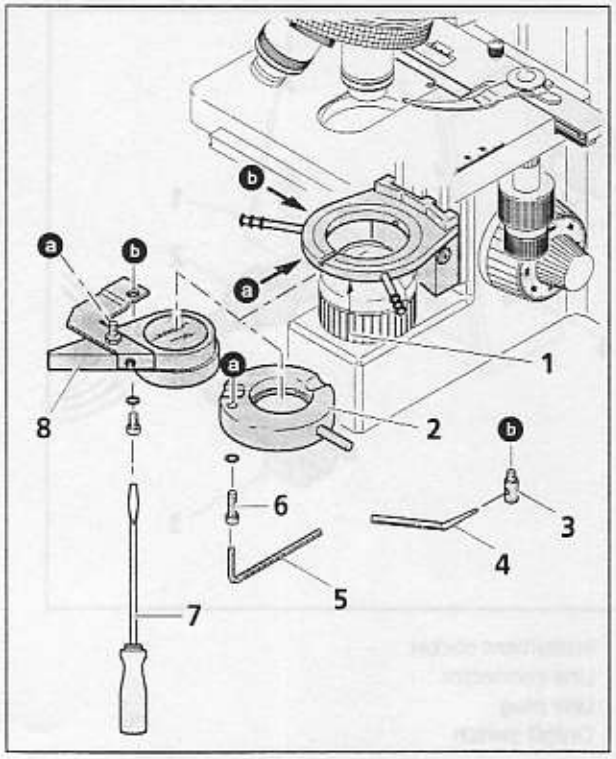
Depending on the brightness set via the control (2-12/**3**), the integrated current control guarantees constant brightness as long as there is sufficient loading capacity from the battery. If the loading capacity is exhausted, the LED illuminator will go out or drop to minimum brightness.

- After connection to the voltage source, switch the LED illuminator on or off via the toggle switch (2-12/**4**).
- Match the illumination intensity via the control (2-12/**3**).

Make absolutely sure to avoid intense moistening of the 12 V battery-adapter cable with liquids

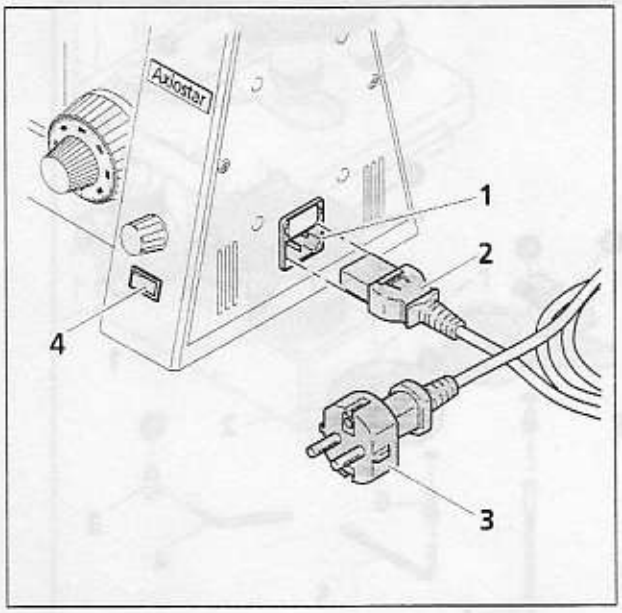
2.8 Attachment of colored disk carrier, polarizer or wide-angle unit

- Hold colored disk carrier (2-13/**2**) parallel to the underside of the condenser carrier (2-13/**1**) and screw the holding bolts of the colored disk carrier (2-13/**6**) into the front thread on the bottom left of the condenser carrier (2-13/**1**, position **a**) using the 90°-offset hexagonal key SW 2 (2-13/**5**) until it engages.
- Screw stop bolt (2-13/**3**) with adjusting lever (2-13/**4**) into the rear thread on the condenser carrier (2-13/**1**, position **b**) until it engages.
- Screw wide-angle unit or swing-in polarizer (2-13/**8**) with exceeding threaded bolt (2-13/**8**, position **a**) into the front threaded hole of the condenser carrier (2-13/**1**, position **a**) by turning the entire wide-angle unit (or the polarizer). Screw in the unit until the threaded hole of the holding angle (2-13/**1**, position **b**) lies below the rear threaded hole of the condenser carrier and contacts the underside of the condenser.
- Then use the slotted screwdriver to screw the holding angle to the underside of the condenser carrier (2-13/**1**, position **b**) with the supplied slotted screw.



1 Condenser carrier
2 Colored disk carrier
3 Stop bolt
4 Adjusting lever
5 Hexagonal key SW 2
6 Holding bolt
7 Slotted screwdriver
8 Wide angle unit or swiveling polarizer

Bild 2-13 Attachment of colored disk carrier, polarizer or wide angle unit



1 Instrument socket
2 Line connector
3 Line plug
4 On/off switch

Bild 2-14 Connecting the instrument to the line

2.9 Connecting the instrument to the line

The microscope can be operated using line voltages of 100 – 240 V without conversion.

- Connect the line cable with connector (2-14/**2**) to the instrument socket (2-14/**1**) and connect the earth-contact plug (2-14/**3**) to the line.
- Switch on the instrument via the on/off switch (2-14/**4**) on the left-hand side of the instrument.
- The green LED integrated into the on/off switch lights up to indicate that the instrument is ready for operation (switch in "I" position). The integrated halogen lamp must also be on.

OPERATION

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3 OPERATION

3.1 Switch on the instrument

- Switch on the instrument via the On/Off switch (3-1/**1**).
- The green LED integrated in the on/off switch lights up to indicate that the instrument is ready for operation (switch in "I" position). The integrated 6 V 20 W long-life halogen lamp must also be on.

☞

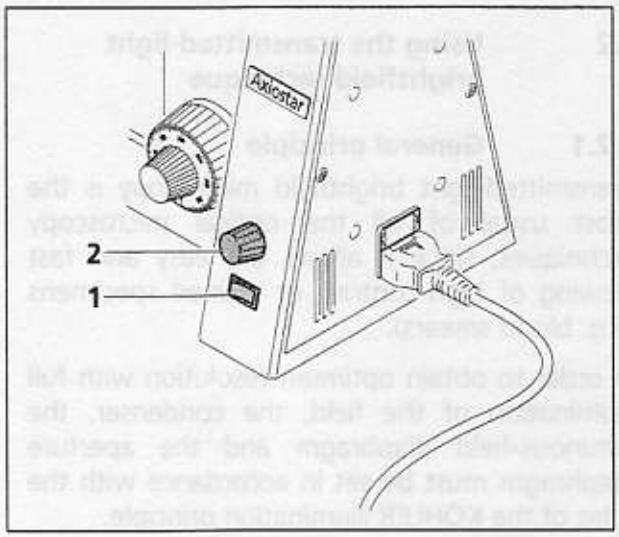
The Axiostar microscope is supplied with factory-aligned illumination. The illumination need not be adjusted even when the lamp is exchanged by the customers themselves.

- Set the required brightness via the brightness control (3-1/**2**).
- Depending on the application, place one or several of the following dia. 32 filters (3-2/**1**) on the dust-protection glass of the luminous-field diaphragm (3-2/**2**) , e.g.

- Interference wide-band filter, green, 32x4, for contrast enhancement in b/w photography of stained sections and for phase contrast.
- CB 3 conversion filter, 32x2, to generate the correct color temperature of 3200 K when artificial light color reversal film is used.
- CB 3, 32x2, and CB 12, 32x2, conversion filters for use with daylight color film.

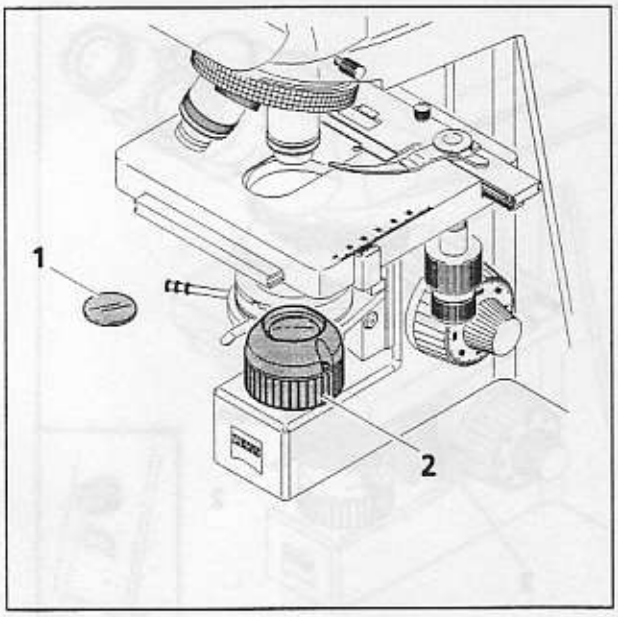
☞

When the LED illuminator is used instead of a condenser, it must be switched on via the toggle switch, and the illumination intensity must be set via the control. Setting of Köhler illumination is not required on account of the homogeneous field illumination up to diameter 20 mm. Only when objective 2.5x is used, it may be necessary to center the LED illuminator and to slightly lower the condenser carrier.



1 On/off switch with integrated control lamp
Brightness control

Fig. 3-1 Switch on the instrument



1 Filter
2 Luminous-field diaphragm with dust protection glass

Fig. 3-2 Insertion of filters

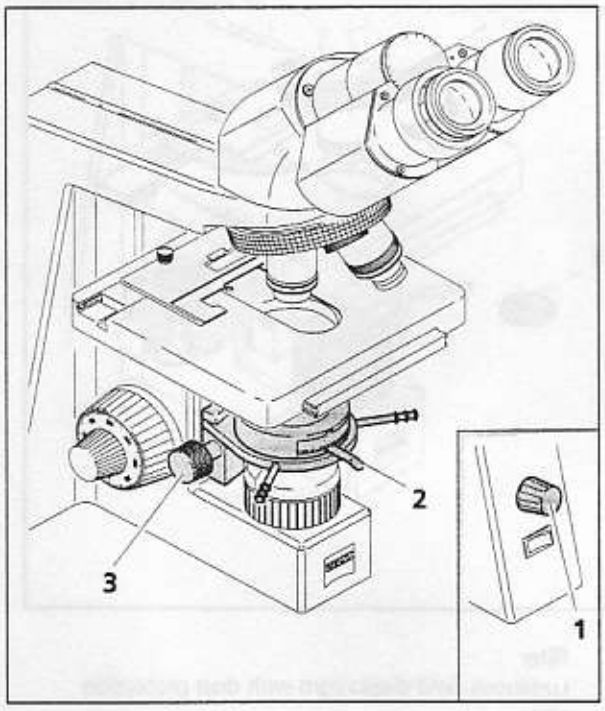
3.2 Using the transmitted-light brightfield technique

3.2.1 General principle

Transmitted-light brightfield microscopy is the most usual of all the optical microscopy techniques, since it allows the easy and fast viewing of high-contrast or stained specimens (e.g. blood smears).

In order to obtain optimum resolution with full illumination of the field, the condenser, the luminous-field diaphragm and the aperture diaphragm must be set in accordance with the rules of the KÖHLER illumination principle.

Here, the illumination cone is adapted to the objective's opening cone. In this way, the numerical aperture of the optical system is used, and "superfluous" light, which can cause interference in the form of scattered light, is prevented.



1 Brightness control
2 Aperture diaphragm lever
3 Condenser drive

Fig. 3-3 ***Transmitted-light brightfield for KÖHLER illumination, preparation***

3.2.2 Transmitted-light brightfield configuration

- Each Axiostar microscope can be configured to permit the transmitted-light brightfield technique.
- When using the Abbe condenser with 5-position turret, set the brightfield position (H) via the turret disk.
- If a slider for phase contrast is available with the Abbe condenser, it must be removed when using the transmitted-light brightfield techique.

3.2.3 Setting of transmitted-light brightfield for KÖHLER illumination

Requirement:

- As described in chapter 2, the microscope is ready for operation and switched on according to section 3.1.

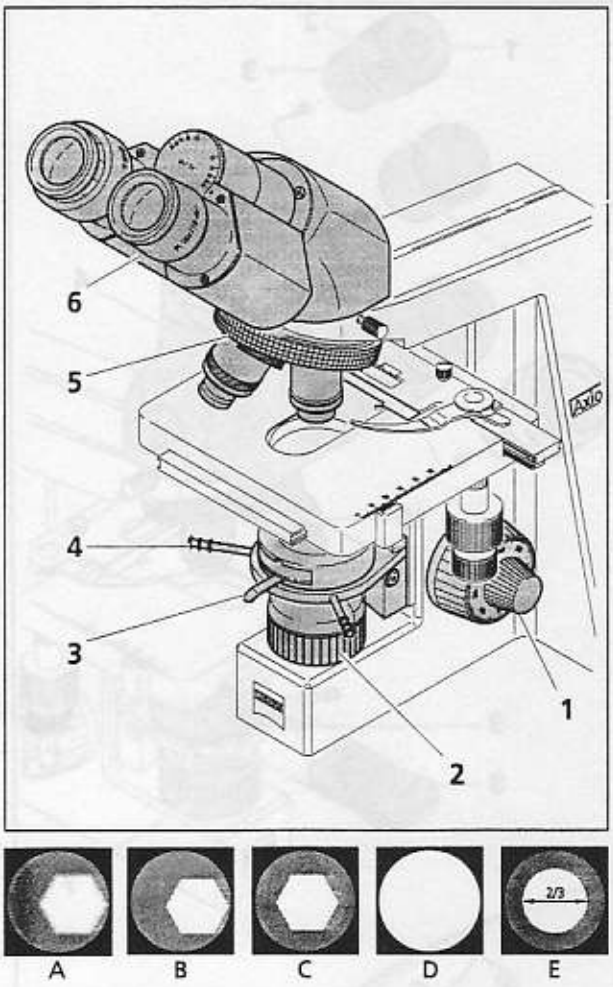
Settings:

- First, place a high-contrast specimen with 0.17 mm cover slip on top of the mechanical stage 75x30 R.
- Set image brightness using the brightness control (3-3/**1**) on the microscope stand.
- Move the Abbe condenser 0.9/1.25 to the upper stop position via the condenser drive (3-3/**3**) and move aperture diaphragm lever (3-3/**2**) to the center position.

☞

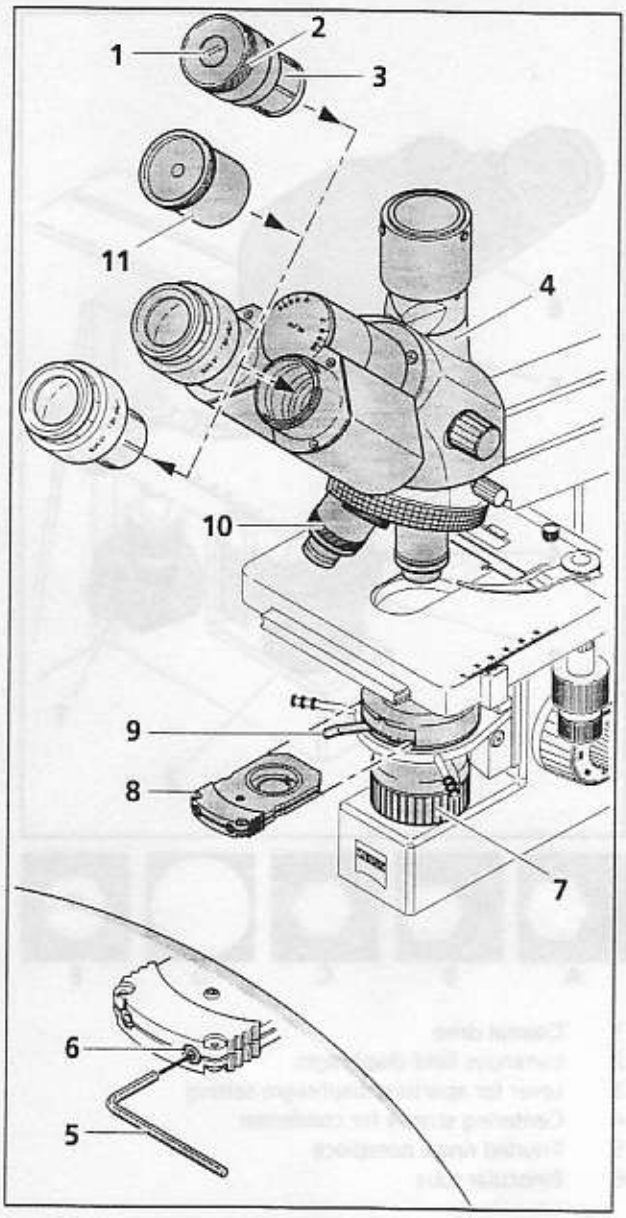
Since field size and the objective aperture change after every objective change, the luminous-field diaphragm and aperture diaphragm settings must be repeated to ensure optimum results. For objectives < 4x, the overview unit must be swung into the beam path *(see chapter 2.8)*.

- Swing 10x objective into beam path via knurled ring (3-4/**5**) of the nosepiece.
- Look through the fixed eyepiece of the binocular tube (3-4/**6**) first and focus on the object via the coaxial drive (3-4/**1**).
- Then set the focus for the other eye by turning the eyelens of the focusing eyepiece.
- Close luminous-field diaphragm (3-4/**2**) until it is visible in the field of view, even if not in focus (3-4/**A**).
- Use the condenser drive (3-3/**3**) to lower the condenser until the luminous-field diaphragm is sufficiently in focus (3-4/**B**)
- Center (3-4/**C**) luminous-field diaphragm using both centering screws (3-4/**4**) and then open it until the edge of the diaphragm just disappears from the field of view (3-4/**D**).
- For aperture diaphragm setting (contrast), remove one eyepiece from the tube and look into the tube with your naked eye. Use lever (3-4/**3**) to set the aperture diaphragm to approx. 2/3 ... 4/5 of the diameter of the objective exit pupil (3-4/**E**). In most applications, this setting of the aperture diaphragm provides optimum contrast at almost full resolution and therefore the best compromise for the human eye.
- Replace eyepiece into the tube.



1 Coaxial drive
2 Luminous field diaphragm
3 Lever for aperture diaphragm setting
4 Centering screws for condenser
5 Knurled ring - nosepiece
6 Binocular tube

Fig. 3-4 ***Setting of transmitted-light brighfield for KÖHLER illumination***



1 Eyelens – auxiliary microscope
2 Knurled ring – auxiliary microscope
3 Auxiliary microscope
4 Binocular tube/phototube
5 Hexagonal key SW 2
6 Centering screws for annular diaphragm centering
7 Luminous field diaphragm
8 Slider for phase contrast
9 Lever for aperture diaphragm
10 Phase contrast objective
11 Diopter

Fig. 3-5 Setting of transmitted-light phase contrast

3.3 Using transmitted-light phase contrast

3.3.1 General principle

The phase contrast technique is ideal for examinations of thin, unstained specimens, e.g. culture cells.

The phase contrast technique uses the optical modulators "phase stop and phase ring" and the interference procedures during the formation of the intermediate image to change the small phase differences in intensity and color differences which are visible to the human eye.

☞

Optimum phase contrast requires a high level of cleanliness!
Therefore, clean the front lens of the objective used, the visible condenser surfaces, the upper cover slip surface and the lower carrier plate surface of the specimen with particular care and carefully remove grease.

3.3.2 Transmitted-light phase contrast configuration

- Abbe condenser 0.9/1.25 and slider for phase contrast, e.g. Ph 2.
- When using the Abbe condenser with 5-position turret, set the relevant phase stop position (Ph1, Ph2 or Ph3) via the turret disk.
- Phase contrast objectives with phase rings Ph 1, Ph 2 or Ph 3 for different average numeric apertures which can also be used in brightfield without any restriction.
- The name of the phase stop on the slider for phase contrast must correspond to the relevant name on the objective, e.g. Ph 1.

3.3.3 Setting of transmitted-light phase contrast

Requirements:

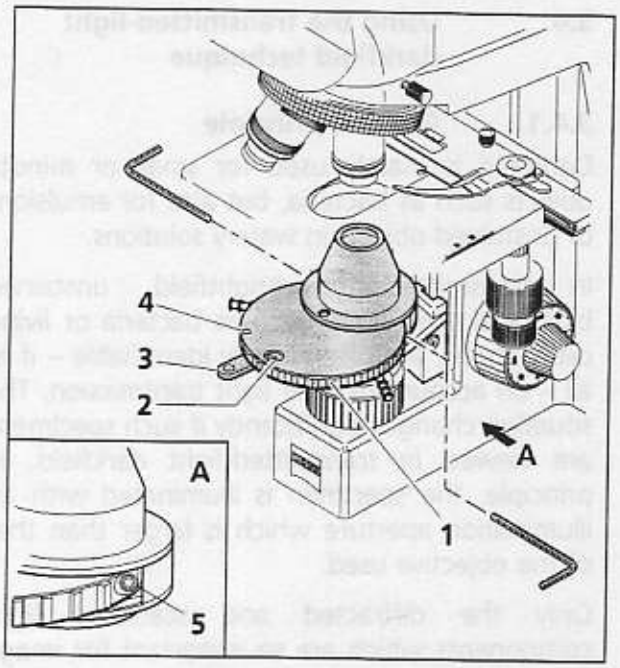
- As described in chapter 2, the microscope is ready for operation and switched on according to section 3.1.
- The microscope must be set for transmitted-light brightfield, as described in section 3.2.

Settings:

- Swing phase contrast objective, e.g. 40x/0.65 Ph 2 (3-5/**10**), into the beam path.
- Open luminous-field diaphragm (3-5/**7**) and aperture diaphragm (3-5/**9**) (or 3-5/**3** on the Abbe condenser with turret).

If a phase stop position (or darkfield position) is set on the turret condenser, a green dot appears in the window of the aperture diaphragm indicating that the stop must be opened completely (green dot on the aperture diaphragm and in the window (3-6/**4**) are in the same row.

- On the condenser, insert the slider for phase contrast (3-5/**8**) with the same name as on the phase contrast objective, e.g. Ph 2, or set the relevant position on the turret disk (3-6/**2**) of the Abbe condenser with 5-position turret.
- Adjust the brightness.
- Check whether phase stop centering complies with the figure (3-7/**B**). For this, remove one eyepiece and replace it with the diopter (3-5/**11**) or a centering telescope (3-5/**3**). Focus on the phase ring by pulling out or pushing in the eyelens (3-5/**1**) of the centering telescope via the knurled ring (3-5/**2**).
- If required, center the phase stop (3-7) via the two adjusting screws (3-5/**6** or 3-6/**5**) using a 90° offset hexagonal key SW 1.5.
- Then replace the diopter or the centering telescope with the eyepiece.



1 Turret disk
2 Window for turret disk position
3 Aperture diaphragm lever
4 Window for aperture diaphragm
5 Adjusting screws for phase stops

Fig. 3-6 ***Setting of Abbe condenser with 5-position turret disk***

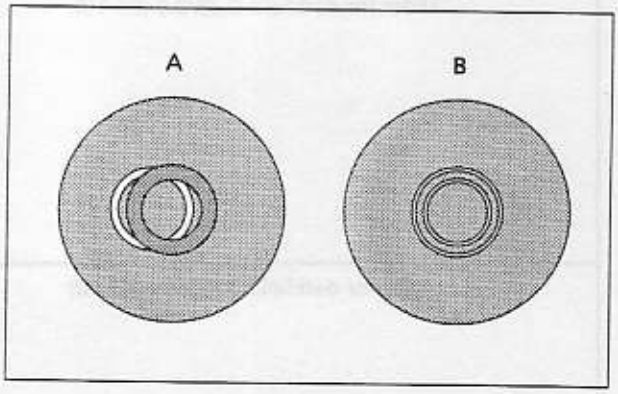


Fig. 3-7 ***Centering of phase stop***

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Complete phase contrast is only achieved if the bright phase stop (in the condenser) and the dark phase ring (in the objective) are exactly congruent in the illumination beam path 3-7/**B**).

3.4 Using the transmitted-light darkfield technique

3.4.1 General principle

Darkfield is mainly used for small or minute objects such as bacteria, but also for emulsions or unstained objects in watery solutions.

In transmitted-light brightfield, unstained biological specimens, such as bacteria or living cell cultures, are often barely identifiable – if at all – on account of their light transmission. The situation changes significantly if such specimens are viewed in transmitted-light darkfield. In principle, the specimen is illuminated with an illumination aperture which is larger than that of the objective used.

Only the diffracted and scattered light components which are so important for image production reach the objective, while the directly reflecting light bundles are guided past the objective.

This is one of the reasons why even fine structures can be resolved and appear bright on a dark background although they partially lie below the resolving power of the light microscope.

3.4.2 Transmitted-light darkfield configuration

- Condenser with slider for darkfield
- When using the Abbe condenser with 5-position turret, set the darkfield position (DF, 0.65 / 0.9) via the turret disk.
- ICS objectives with a numerical aperture which is smaller than that of the used darkfield stop.
- For further details, please see the following table:

Condenser with slider for contrasting techniques	Suitable objectives
Slider for darkfield 0.25/0.9 (DF 10)	CP-Achromat 5x/0 .12
	CP-Achromat 10x/0 .25
	A-Plan 5x/0 .12
	A-Plan 10x/0 .25
	Achroplan 4x/0 .10
	Plan-Neofluar 2 .5x/0 .075
Slider for darkfield 0 .65/0.9 (DF 40)	CP-Achromat 10x/0 .25
	CP-Achromat 40x/0 .65
	A-Plan 10x/0 .25
	A-Plan 20x/0 .45
	Achroplan 10x/0 .25
	Achroplan 20x/0 .45
	Achroplan 40x/0 .65
Slider for phase contrast Ph 1	All engraved Ph 1
Slider for phase contrast Ph 2	All engraved Ph 2
Slider for phase contrast Ph 3	All engraved Ph 3

3.4.3 Setting of transmitted-light darkfield

Before starting:

- As described in chapter 2, the microscope is ready for operation and switched on according to section 3.1.

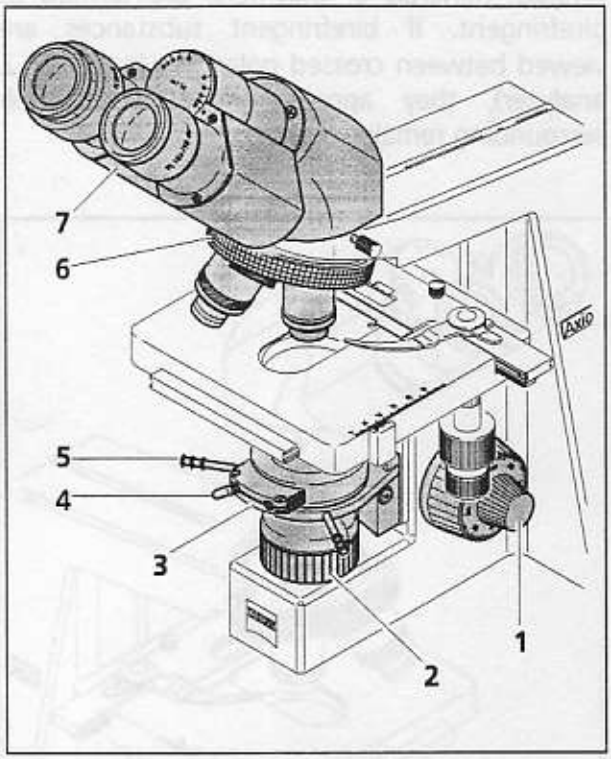
Settings:

- Set KÖHLER illumination in the same way as for transmitted-light brightfield, e.g. with objective 10x.
- Insert the relevant slider (3-8/**3**) for darkfield – see table on page 3-8 – into the opening on the condenser until stop.
- Open the luminous-field diaphragm.
- Increase the brightness setting on the potentiometer.
- If the image center is too bright or too dark, sensitively correct the condenser height until the field of view appears homogeneously dark or features homogeneous brightness distribution.

For darkfield setting, it is also possible to use the slider for phase contrast 3 and the following objectives instead of the slider for darkfield 0.25/0.9: CP-Achromat, A-Plan and Plan-Neofluar 2.5x – 10x and Achroplan 4x.

☞

Darkfield specimens require a considerably higher level of cleanliness than specimens for other methods; fingerprints, dirt and dust in particular brighten the background and reduce the contrast of the object image.



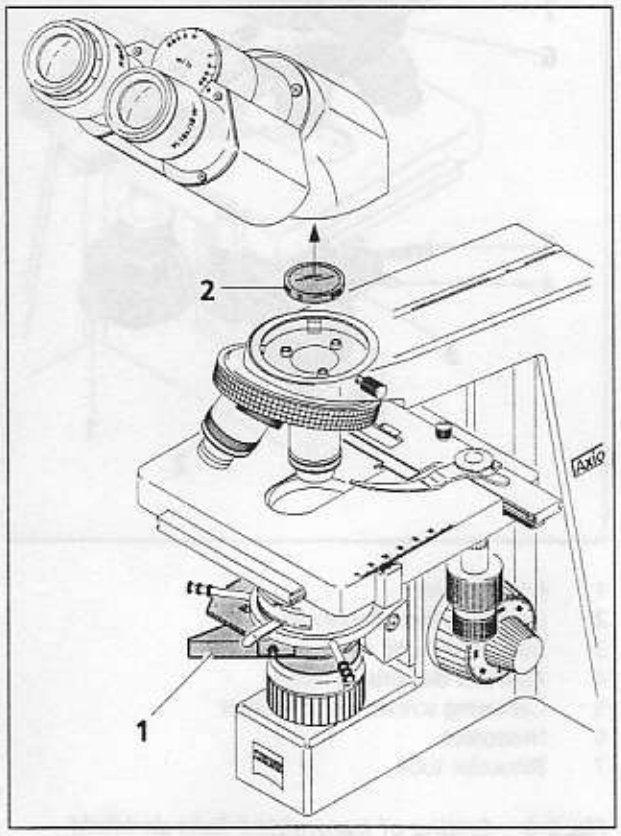
1 Coaxial drive
2 Luminous field diaphragm
3 Dark field slider
4 Aperture diaphragm lever
5 Centering screws for condenser
6 Nosepiece
7 Binocular tube

Fig. 3-8 Setting of transmitted-light darkfield

3.5 Using transmitted-light polarization contrast

3.5.1 General principle

The transmitted-light polarization technique is used with specimens which change the polarization state of light. Such specimens, e.g. crystals, minerals or polymers, are termed as birefringent. If birefringent substances are viewed between crossed polarizers (polarizer ⊥ analyzer), they appear bright while their surrounding remains dark.



1 Polarizer on swing-out carrier
2 Analyzer

Fig. 3-9 Setting of transmitted-light polarization contrast

Birefringent substances are recognized by the fact that they display 4 bright and 4 dark positions between crossed polarizers after rotation of the specimen around 360°. Depending on the level of birefringence, thickness and orientation of the object, interference colors will occur from gray (usually in biological objects) to white, yellow, red and blue. These interference colors can be of 1st or higher order.

3.5.2 Transmitted-light polarization contrast configuration

- Polarizer, oriented in EAST-WEST direction, mounted on swing-out carrier (3-9/**1**)
- Analyzer, oriented in NORTH-SOUTH direction (3-9/**2**)

3.5.3 Setting of transmitted-light polarization contrast

Before starting:

- As described in chapter 2, the microscope is ready for operation and switched on according to section 3.1.
- The microscope must be set for transmitted-light brightfield, as described in section 3.2.

Settings:

- Screw NORTH-SOUTH-oriented analyzer (3-9/**2**) into the tube (removed from the stand) from below. NORTH-SOUTH orientation is available when the marking on the analyzer is aligned along the longitudinal axis of the stand.
- Swing polarizer (3-9/**1**) into the beam path; the field of view appears dark because of the crossed polarizers.
- Move the object to be examined into the field of view. Birefringent (anisotropic) objects now usually exhibit the optical effects described above.

3.5.4 Sample differentiation between gout and pseudogout

- Move two polarizers to the dark position (analyzer NORTH-SOUTH-oriented, polarizer EAST-WEST-oriented).
- Swing in lambda plate and, if a **rotary** lambda plate is available (e.g. 445226-0000-000), set the oscillation direction to 45° (γ, stop position).
- Select crystal needles which are oriented in the gamma direction (see marking on the lambda plate).

Analysis:

- If the crystal needles oriented parallel to the gamma direction of the lambda plate are yellow, and the crystal needles lying at a right angle to the gamma direction are blue, the crystals are monosodium urate crystals (gout).
- If the crystal needles oriented parallel to the gamma direction of the lambda plate are blue, and the crystal needles lying at a right angle to the gamma direction are yellow, the crystals are calcium pyrophosphate crystals (pseudogout).

This analysis is also possible using a polarizer with cemented lambda plate which can be placed on the luminous-field diaphragm. In that case, the lambda plate needs not be rotated.

3.6 Measurement of lengths

Before starting:

The measurement of lengths using the Axiostar requires the following, for example:

- stage micrometer, positive 5 + 100/100 y D = 0.17 mm
- eyepiece crossline micrometer 10 : 100, d=26 mm
- An overview of available stage micrometers and eyepiece reticles is provided in chapter 1.6.

☞

The distance to be measured should be ≥ 5 mm in the intermediate eyepiece image in order to keep the influence of random measuring deviations as low as possible.
Other measuring errors can occur if the eyepiece has not been inserted into the tube until stop.

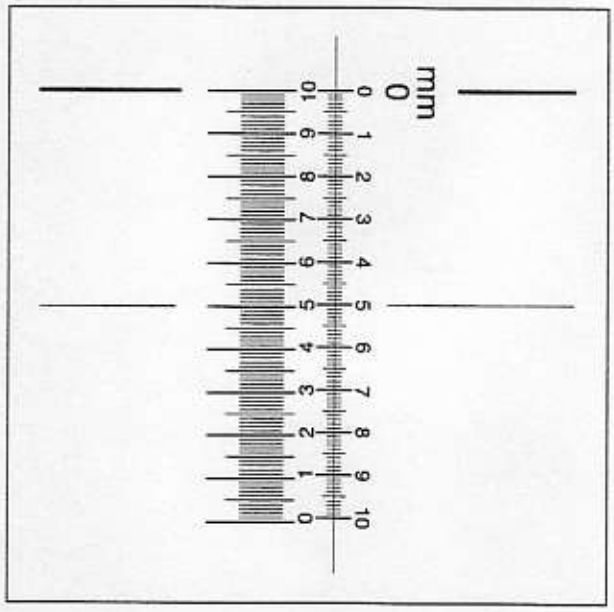


Fig. 3-10 Length measurement

Settings:

Before the length measurement using the microscope can be performed, the micrometer or scale value of the used objective / eyepiece reticle combination must be determined. This scale value is exactly that distance in the specimen which complies to one interval of the used eyepiece crossline micrometer.

For calibration, align the scales of the stage micrometer and the crossline micrometer parallel to each other by turning the eyepiece, and make the zero lines of both scales exactly congruent.

If, for example, 99 increments (of 10 µm each) of the stage micrometer correspond to exactly 100 increments of the crossline micrometer, as in Fig. 3-10, the resulting scale value k' for the used objective / eyepiece reticle combination (A-Plan 10x/0.25 and crossline micrometer 10:100) is

$$k' = \frac{99}{100} \times 10\ \mu m = 9.9\ \mu m$$

After exchange of the stage micrometer for the specimen to be measured, the measuring distance of interest L results from the number of increments of the eyepiece crossline micrometer (tenth estimated) multiplied with the scale value k':

$L = 35.5 \times 9.9\ \mu m = 351.5\ \mu m.$

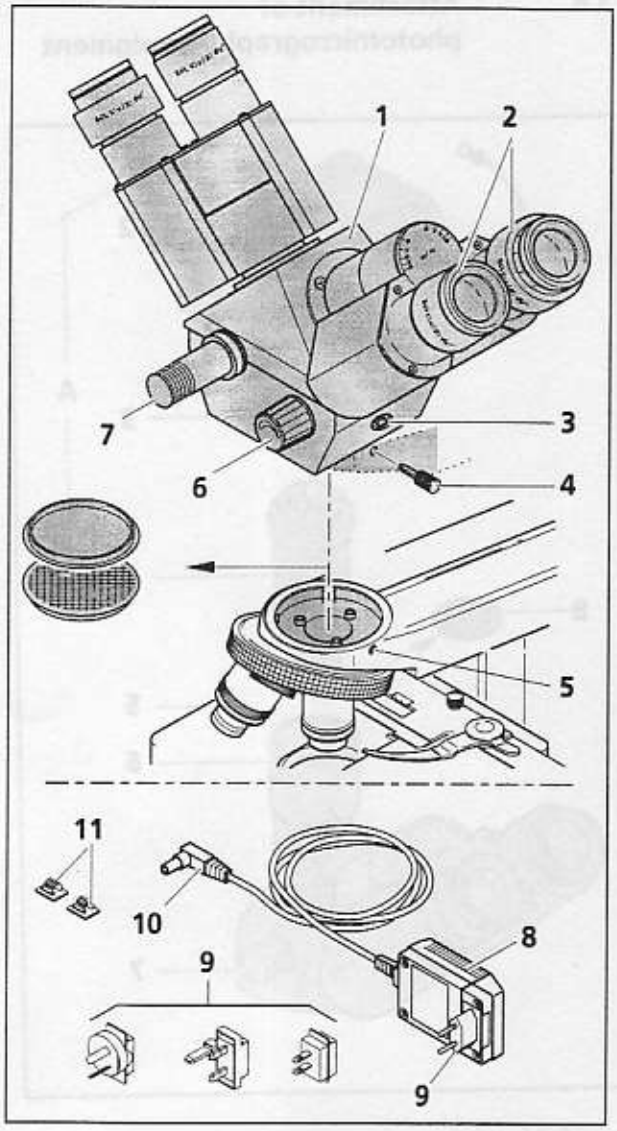
Particularly large object structures can also be determined by using the vernier scale gradations (0.1 mm) on the mechanical stage. Here, it might be necessary to determine the distance to be measured through calculation from a combined x and y measurement (Pythagoras).

3.7 Attachment of ICS double tube

- Loosen knurled screw (3-11/**4**) on the stand and remove binocular tube, if available.
- Remove dust covers from the tube underside and from the dovetail mount on the stand.
- Hold ICS double tube (3-11/**1**) to the left in a slightly inclined position, insert its dovetail into the stand mount, turn it into the required viewing direction and use the knurled screw (3-11/**4** or hexagonal screw) to clamp it into the threaded opening (3-11/**5**). Both the illustrated rotation and the 90° backward rotation are possible. Accordingly, the controls of the ICS double tube are accessible to the user from the side or from the front.
- Remove dust caps from the eyepiece tubes and insert two eyepieces each (3-11/**2**) with field number 18.
- Insert country-specific adapter (3-11/**9**) into the power unit (3-11/**8**).
- Insert angled connector (3-11/**10**) of the power unit into the 12 V socket (3-11/**3**) of the ICS double tube.
- Use the enclosed self-adhesive cable holders (3-11/**11**) to suitably attach the cable to the stand and guide it to the back.
- Connect power unit to the line.

The ICS double tube is operated via:

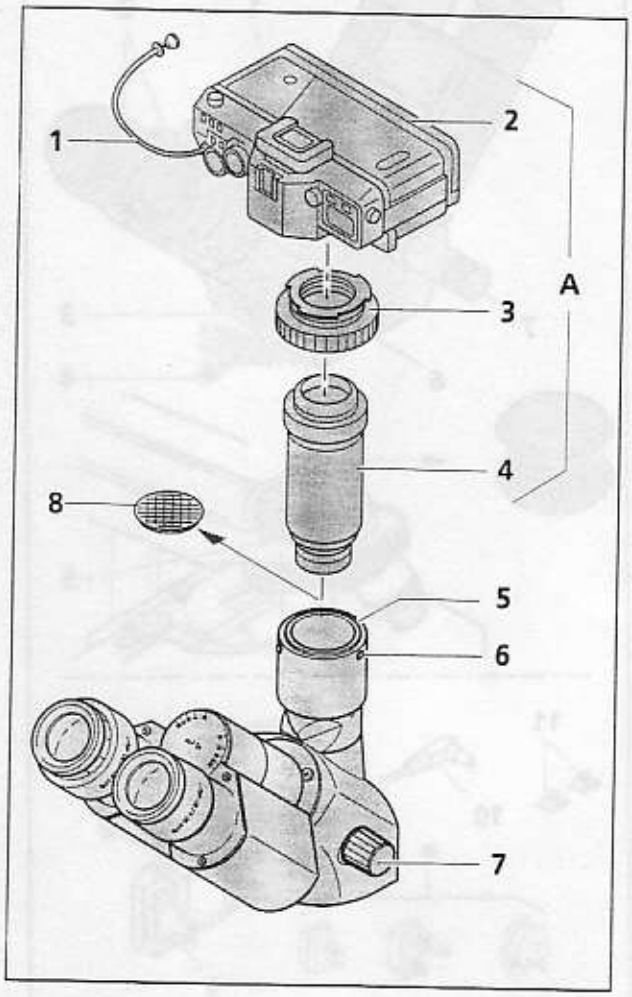
- Adjusting lever (3-11/**7**) for the positioning of the light pointer in the microscope image
- Control (3-11/**6**) to set the brightness of the light pointer.



1 ICS double tube
2 Eyepieces
3 12 V socket
4 Knurled screw (or hexagonal screw)
5 Threaded opening for knurled screw or hexagonal screw
6 Control for intensity of light pointer
7 Adjusting lever for light pointer
8 Power unit
9 Country-specific adapter
10 Angled connector
11 Cable holder

Fig. 3-11 ICS double tube

3.8 Attachment of photomicrography equipment



1 Cable release
2 Camera housing
3 T2-Adapter for CONTAX bayonet
4 2.5× connector for T2
5 Phototube
6 Hexagonal screws
7 Control
8 Dust protection cap

Fig. 3-12 Attachment of SLR camera, e.g. CONTAX ARIA

The Axiostar microscope with phototube can be changed from observation to photomicrography via the knob (3-12/**7** and 3-12/**8**) attached to both sides of the phototube (photomicrography position: turned to the left until stop, i.e. 100 % doc). In the rear position of the knob, the beam path is directed to the eyepieces (100 % vis). Special adapters allow commercially available 35 mm SLR cameras and special microscope cameras (e.g. MC 80 DX) to be attached to the camera port of the Axiostar.

If focusing is not to be made via the viewfinder of the camera, the component with the eyepiece reticle must be screwed in the eyepieces (also see sections 1.6 and 2.4.1).

- For focusing, set the eyepiece until the reticle is imaged in focus.
- Then focus until both the microscope image and the reticle are in focus.

3.8.1 Attachment of SLR camera, e.g. CONTAX ARIA

- Screw T-2 adapter (3-12/**3**) for the CONTAX bayonet on the 2.5x connector for T2 (3-12/**4**) (456005-0000-000).
- Attach camera housing (3-12/**2**) and cable release (3-12/**1**), if required.
- Loosen three hexagonal screws (3-12/**6**) remove the dust cover (3-12/**8**) from the phototube (3-12/**5**) and insert the premounted unit (3-12/**A**) in the phototube.
- Align the camera unit in the required position and tighten the three hexagonal screws (3-12/**6**).
- For photomicrography, turn control (3-12/**7**) to the left until stop.

☞

For the use of the photomicrography equipment, please observe the relevant separate manuals in addition to the information provided in this manual.

When artificial light color reversal film is used, the CB 3 conversion filter provides the correct color temperature of 3200 K. The filter must be placed on the dust cover of the luminous-field diaphragm (3-2/**2**), as mentioned in chapter 3.1.

For daylight color reversal film, the CB 12 conversion filter must be used in addition to the CB 3 conversion filter.

Various T2 adapters for SLR cameras are listed below:

T2 adapters for SLR camera housings	Cat. No.
T2 adapter for CONTAX (CONTAX bayonet)	416010-0000-000
T2 adapter for OLYMPUS OM (OM bayonet)	416002-0000-000
T2 adapter for MINOLTA (SR bayonet)	416003-0000-000
T2 adapter for CANON (FD bayonet)	416004-0000-000
T2 adapter for NIKON (F bayonet)	416009-0000-000
T2 adapter for PENTAX (KA bayonet)	416011-0000-000

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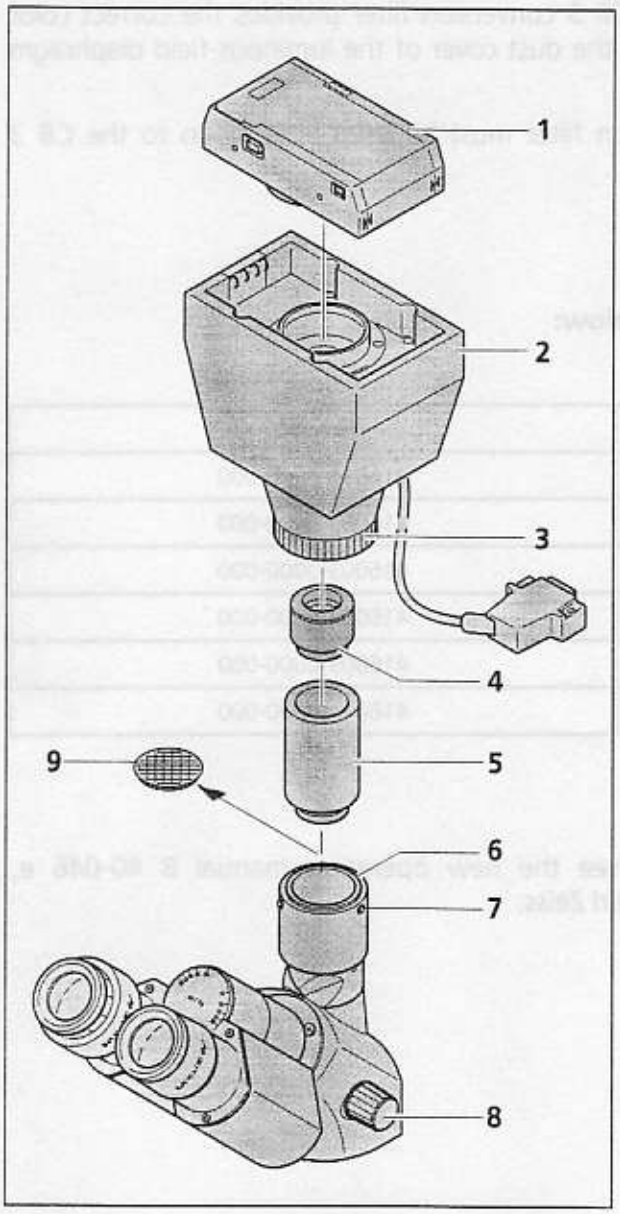
For detailed information on SLR cameras, please see the new operating manual B 40-046 e, Photomicrography using 35 mm SLR cameras, from Carl Zeiss.



1 35 mm Mot DX film cassette
2 MC 80 DX basic body
3 Clamping ring
4 P 2.5x projection lens
5 Adapter 60 for microscope cameras
6 Phototube
7 Hexagonal screws
8 Control
9 Dust protection cap

Fig. 3-13 Attachment of MC 80 DX microscope camera

3.8.2 Attachment of MC 80 DX microscope camera (film cassette 35 mm)

- Loosen hexagonal screws (3-13/**7**) and remove dust protection cap (3-13/**9**) from the phototube.
- Insert adapter 60 for microscope camera (3-13/**5**) (456006-0000-000) into phototube (3-13/**6**) and fix it using three hexagonal screws (3-13/**7**).
- Insert P 2.5x projection lens (3-13/**4**) into adapter 60 for microscope cameras (3-13/**5**).
- Attach MC 80 DX basic body (3-13/**2**) onto adapter 60 for microscope cameras until stop, align it and fix it by turning clamping ring (3-13/**3**) anti-clockwise.
- Attach 35 mm Mot DX film cassette (3-13/**1**) to the basic body in such a way that the contact pins firmly engage in the relevant sockets.
- For microphotography, turn control (3-13/**8**) to the left until stop.

When artificial light color reversal film is used, the CB 3 conversion filter provides the correct color temperature of 3200 K. The filter must be placed on the dust cover of the luminous-field diaphragm (3-2/**2**), as mentioned in chapter 3.1.

For daylight color reversal film, the CB 12 conversion filter must also be used. The filter must be placed on the dust cover of the luminous-field diaphragm (3-2/**2**), as described in chapter 3.1.

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For detailed information on the MC 80 DX, please see manual B 40-036-e.

3.9 Attachment of adapters for video cameras

The following video adapters and video zoom adapters with interface 60 permit the attachment of 1-chip b/w and color cameras and 3-chip CCD cameras to the phototube of the Axiostar.

Tube	Adapter	Cameras
AXIOSTAR PHOTO-TUBE-WITH INTER-FACE 60 MM	**456105-0000-000** 60 C 2/3" 1.0×	CAMERAS WITH C-MOUNT
	000000-1069-414 60 C 2/3" 0.63×	
	456106-0000-000 60 C 1/2" 0.5×	
	456108-0000-000 60 C 1/3" 0 .4×	
	452989-0000-000 Zoom 44 C 1/3" (3 CCD) 0 .35x ... 1 .6x To be used with: **456140-0000-000**	
	456115-0000-000 60 ENG 2/3" 1 .0×	3-CHIP CAMERAS WITH 2/3" BAYONET
	452984-0000-000 Zoom 44 ENG 1/2" 0 .5× ... 2 .4× To be used with: **456140-0000-000**	3-CHIP CAMERAS WITH 1/2" BAYONET
	452992-0000-000 44 ENG 1/2" 0 .63× To be used with: **456140-0000-000**	

The connecting piece 60 - 44 also allows video adapters with 44 mm interface to be used with the phototube of the Axiostar with 60 mm interface.

Video adapter (Cat. No.)	Suitable for	Comments
456140-0000-000 Connecting piece 60 - 44	Microscopes with interface 60 mm and all video adapters for 44 mm interface.	Connects video adapters for 44 mm interface to microscopes with 60 mm interface.

☞

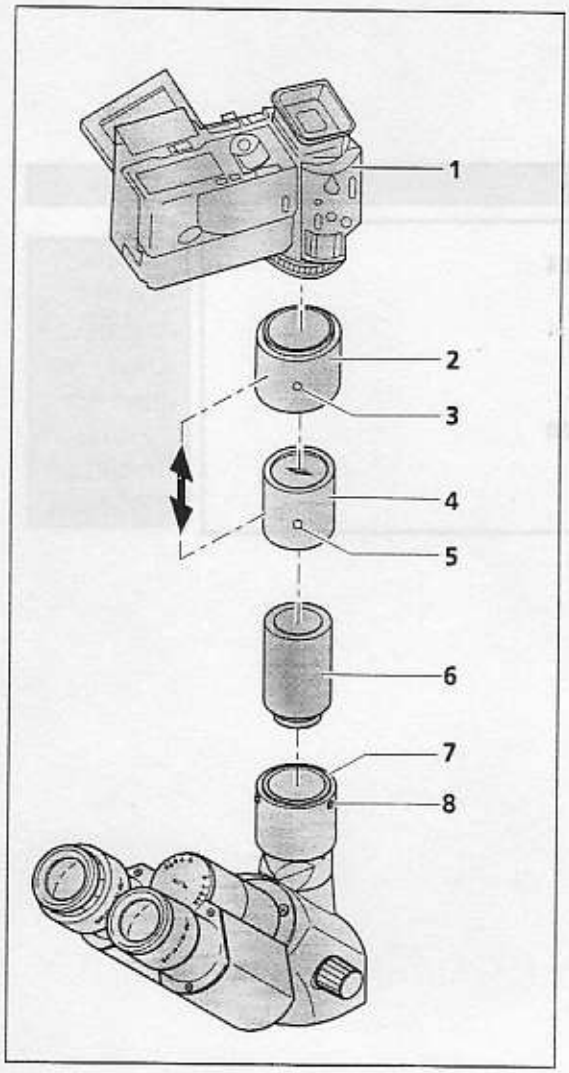
The instructions of the camera manufacturer must also be observed when operating the video camera.

Attachment and settings:

- Loosen three hexagonal screws and remove dust cover from the camera tube of the Axiostar.
- Screw video adapter or video zoom adapter with C-mount thread into the video camera.
- Insert video adapter or video zoom adapter in ENG 2/3" or ENG ½" bayonet of the video camera and clamp it tight.
- Insert premounted unit (video camera with video adapter or video zoom adapter) in camera tube of the Axiostar, align it and fix it using the three hexagonal screws.
- Insert eyepiece with photo reticle in the binocular tube and align photo reticle parallel to the camera.
- Swing out folding prism on the binocular phototube to direct 100 % of the light to the camera port.
- Set the required zoom magnification factor via the wheel of the video zoom adapter.
- If required, adjust image brightness on the monitor by changing the lamp brightness on the microscope stand.

3.10 Attachment of adapters for digital compact cameras

Tube	Adapter		Cameras
AXIOSTAR PHOTO-TUBE WITH INTER-FACE 60 MM	000000-1096-522 D40 M52x0.75 To be used with: 456006-0000-000	000000-1108-984 44 M52x0.75 To be used with: 456140-0000-000	COMPACT DIGITAL CAMERAS / CAMCOR-DERS WITH FILTER THREAD 37/52 MM



1 SONY DCR-PC100 camera
2 Sliding mount with thread M37
3 Set screw
4 Lens mount
5 Set screw
6 Connector 60 for microscope camera
7 Binocular phototube
8 Set screw

Fig. 3-14 ***Attachment of Sony "Digital Handycam DCR-PC100" camera***

3.10.1 Digital cameras with 37 mm filter thread, e.g. SONY DCR-PC100 / SONY DSC – S50

When delivered, the sliding mount with thread M37 (3-14/**2**) and the lens mount (3-14/**4**) are premounted. The drawing on the right shows the disassembled status.

- Remove threaded adapter ring M37/M52 (3-15/**3**).
- Plug connector 60 (3-14/**6**) onto the binocular phototube (3-14/**7**) and tighten the 3 set screws (3-14/**8**).
- Screw the unit, consisting of sliding mount with thread M37 (3-14/**2**) and lens mount (3-14/**4**), into the M37 filter thread of the camera (3-14/**1**).
- With the lens mount (3-14/**4**) pointing forward, plug the unit onto connector 60 (3-14/**6**) until stop and tighten the set screw (3-14/**5**).

Depending on the microscope configuration and the camera used, the distance between the camera lens and the lens mount (3-14/**4**) must perhaps be optimized (see double arrow). This is required in particular if an untrimmed image cannot be achieved in any zoom position of the camera lens.

Make the following settings on the camera:

- Switch off the autofocus.
- Set the distance to ∞.
- Set the automatic exposure control to time priority.
- Set the aperture as wide as possible (i.e. select a small f-stop number!).

Not all cameras feature these possibilities. Please see the operating instructions of the camera used.

- Loosen the set screw (3-14/**3**).
- Vary the distance between the camera lens and the lens mount in steps, i.e. move the sliding mount with camera on the lens mount by defined steps.

- Zoom camera lens from wide-angle position (W) through to tele position (T).
- Perform test until image is format-filling without trimming or vignetting.
- Tighten the set screw (3-14/**3**) again.

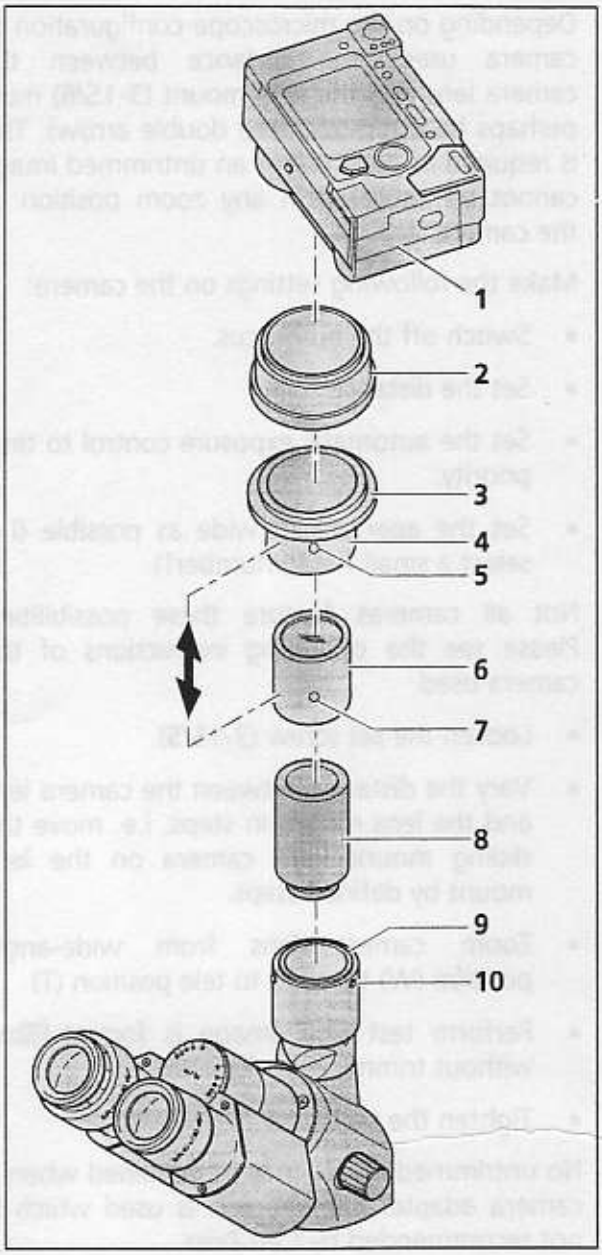
No untrimmed image may be obtained when a camera adapter combination is used which is not recommended by Carl Zeiss.

3.10.2 Digital cameras with 52 mm filter thread, e.g. SONY DSC – S70

When delivered, the sliding mount (3-15/**4**), the threaded adapter ring M37/M52 (3-15/**3**) and the lens mount (3-15/**6**) are premounted. The drawing on the right shows the disassembled status.

Furthermore, the threaded ring adapter M37/52 (3-15/**3**) can be unscrewed from the sliding mount (3-15/**4**) (not shown), i.e. cameras with M37 can also be attached as described in the previous chapter.

- Screw SONY VAD-S70 adapter ring (3-15/**2**) into the objective/filter thread of the DSC-S70 camera (3-15/**1**) until stop.
- Plug connector 60 (3-15/**8**) onto the binocular phototube (3-15/**9**) and tighten the 3 set screws (3-15/**10**).
- Screw the unit, consisting of sliding mount (3-15/**4**), the threaded adapter ring M37/M52 (3-15/**3**) and the lens mount (3-15/**6**) into the SONY VAD-S70 adapter ring (3-15/**2**).
- With the lens mount (3-15/**6**) pointing forward, plug the unit onto connector 60 (3-15/**8**) until stop and tighten the set screw (3-15/**7**).



1 SONY DSC-S70 camera
2 SONY VAD-S70 adapter ring
3 M37/M52 threaded adapter ring
4 Sliding mount
5 Set screw
6 Lens mount
7 Set screw
8 Connector 60 for microscope camera
9 Binocular phototube
10 Set screw

Fig. 3-15 ***Attachment of Sony "Digital Still Camera DSC-S70"***

Depending on the microscope configuration or camera used, the distance between the camera lens and the lens mount (3-15/**6**) must perhaps be optimized (see double arrow). This is required in particular if an untrimmed image cannot be achieved in any zoom position of the camera lens.

Make the following settings on the camera:

- Switch off the autofocus.
- Set the distance to ∞.
- Set the automatic exposure control to time priority.
- Set the aperture as wide as possible (i.e. select a small f-stop number!).

Not all cameras feature these possibilities. Please see the operating instructions of the camera used.

- Loosen the set screw (3-15/**5**).
- Vary the distance between the camera lens and the lens mount in steps, i.e. move the sliding mount with camera on the lens mount by defined steps.
- Zoom camera lens from wide-angle position (W) through to tele position (T).
- Perform test until image is format-filling without trimming or vignetting.
- Tighten the set screw (3-15/**5**) again.

No untrimmed image may be obtained when a camera adapter combination is used which is not recommended by Carl Zeiss.

3.10.3 Attachment of cameras with other filter thread sizes

In principle, it is also possible to connect cameras with a filter thread other than M37 or M52. Suitable filter adapters or reduction rings are available in photo shops. As mentioned above, only a test can clarify whether such cameras are compatible with the digital adapters.

3.10.4 Sony DSC-S70 on digital camera adapter 44 M52x0.75, 000000-1108-984

This adapter has been particularly designed for the Sony DSC-S70. Combined with Plan objectives, e.g. Plan-Neofluar objectives, increased edge definition and lower distortion can be achieved. Should future cameras prove to be suitable, too, our sales staff will be informed accordingly.

Attachment of the camera requires the SONY VAD S 70 adapter ring (Fig. xxx/2). Furthermore, the connecting piece 60-44 (456140-0000-000) must be inserted between the camera adapter and the binocular tube.

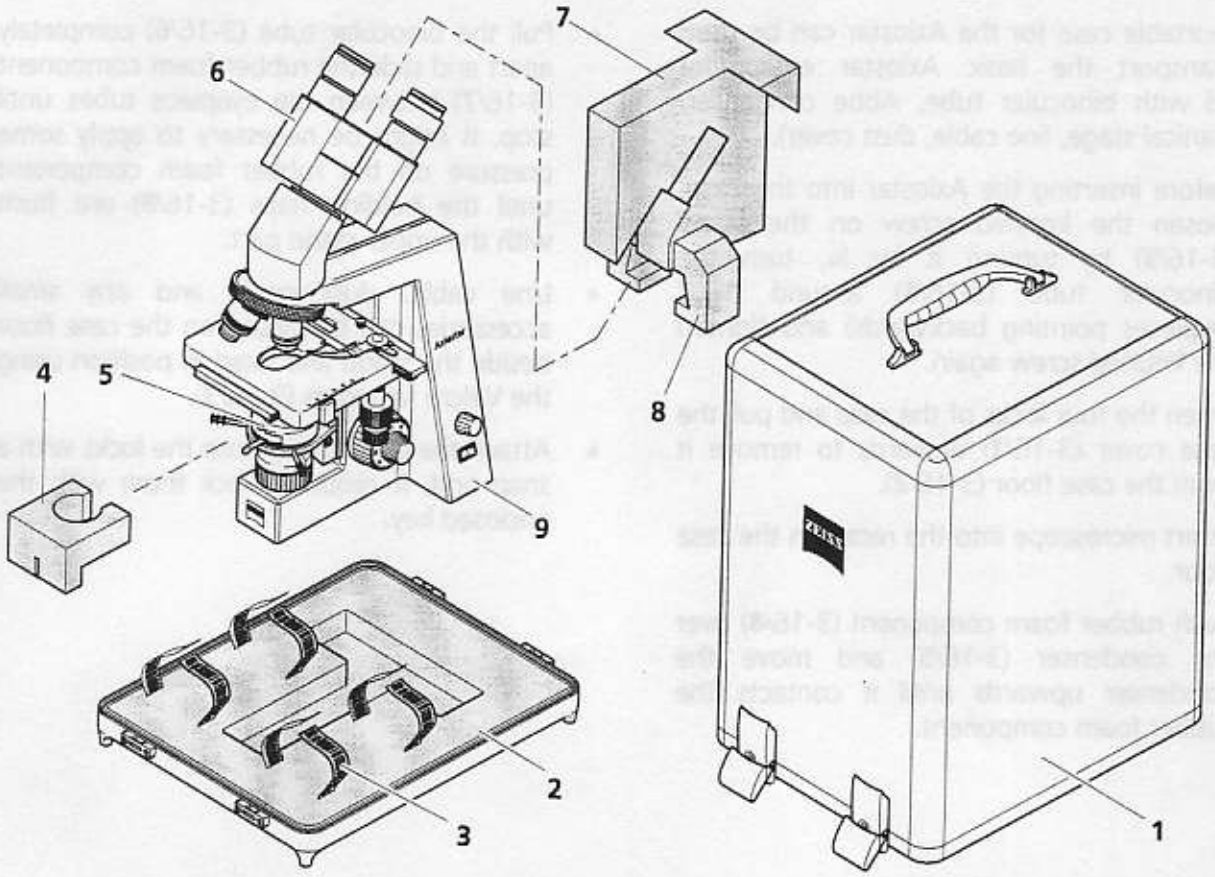
Make the following settings on the camera:

- Switch off the autofocus.
- Set the distance to ∞.
- Set the automatic exposure control to time priority.
- Set the aperture as wide as possible (i.e. select a small f-stop number!).

3.11 Packing the instrument

The portable case for the Axiostar can be used to transport the basic Axiostar equipment (stand with binocular tube, Abbe condenser, mechanical stage, line cable, dust cover).

- Before inserting the Axiostar into the case, loosen the knurled screw on the stand (3-16/**9**) by turning it by ¼, turn the binocular tube (3-16/**6**) around 180° (eypieces pointing backwards) and tighten the knurled screw again.
- Open the four locks of the case and pull the case cover (3-16/**1**) upwards to remove it from the case floor (3-16/**2**).
- Insert microscope into the recess in the case floor.
- Push rubber foam component (3-16/**4**) over the condenser (3-16/**5**) and move the condenser upwards until it contacts the rubber foam component.
- Pull the binocular tube (3-16/**6**) completely apart and slide the rubber foam component (3-16/**7**) between the eyepiece tubes until stop. It might be necessary to apply some pressure on the rubber foam component until the holding flaps (3-16/**8**) are flush with the upper stand part.
- Line cable, dust cover and any small accessories can be placed on the case floor beside the stand and fixed in position using the Velcro fasteners (3-16/**3**).
- Attach the case cover, close the locks with a snap and, if required, lock them with the enclosed key.



1 Case cover
2 Case floor
3 Velcro fasteners
4 Rubber foam component
5 Condenser
6 Binocular tube
7 Rubber foam component
8 Holding flaps
9 Stand

Fig. 3-16 Inserting the Axiostar in the case

CARE, MAINTENANCE AND TROUBLESHOOTING

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4 CARE, MAINTENANCE AND TROUBLESHOOTING

4.1 Care and maintenance of the instrument

Care of the Axiostar is limited to the following operations:

- Cover the instrument with the dust cover after every use.
- Do not set up the instrument in a damp room, i.e. max. humidity < 85%.
- Cover open tubes with dust protection caps.
- Remove dust and dirt from visible optical surfaces using a brush, airblower, Q-tip, optics cleaning paper or a cotton cloth.
- Remove water-soluble dirt (coffee, Coke, etc.) after breathing on it and wiping it off with a dust-free cotton cloth or a moistened cloth. A mild cleaning agent can also be added to the water.
- Remove stubborn, oily or greasy dirt (immersion oils, finger prints) with a wad of cotton or a dust-free cotton cloth dipped in the optics cleaning mixture L.
  This cleaning mixture is produced of 90 Vol% benzoline and 10 Vol% isopropanol (IPA). The various components are also known under the following synonyms:

benzoline:	medical alcohol, petroleum ether
Isopropanol	2-propanol, dimethyl carbinol, 2-hydroxypropane

Clean the optical surface by moving in circles starting in the middle. Slight pressure should be exerted on the optics during cleaning.

When using the Axiostar in humid climatic zones, proceed as follows:

- Store the Axiostar in bright, dry and well ventilated rooms with a humidity of less than 85 %; store particularly sensitive components and accessories, such as objectives and eyepieces, in a dry closet.

The risk of growth of fungus on opto-mechanical instruments always exists in the following conditions:

- Relative humidity of more than 75% and temperatures between +15° C and +35° C for more than three days.
- Installation in dark rooms without air ventilation.
- Dust deposits and fingerprints on optical surfaces.

4.2 Troubleshooting

Troubleshooting for the Axiostar is described in further detail using the following two examples:

- changing the fuses and
- changing the 6 V, 20 W halogen lamp

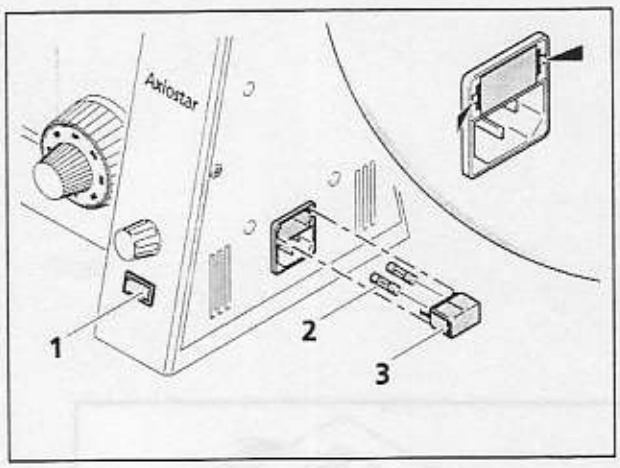
Further measures are summarized in the table under 4.2.3.

4.2.1 Changing the fuses

- Switch off the instrument via the on/off switch (4-1/**1**), disconnect line plug from the line and disconnect line connector from instrument socket.
- Check line cable and plugs and exchange them, if required.
- Use a 2.0 mm clockmaker's screwdriver to press in the two spring shackles on the sides of the fuse holder over the slot and remove the fuse holder (4-1/**3**).
- Remove defective fuse inserts (4-1/**2**) from the fuse holder and replace them with new ones
- Reinsert the fuse holder containing the new fuses; the spring shackles on the sides must audibly lock into place.

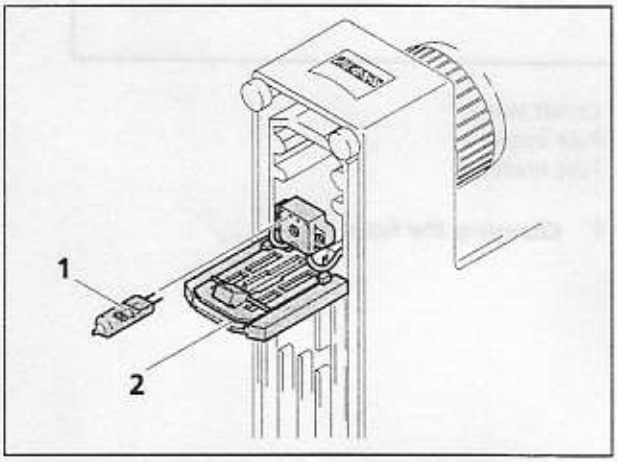
T 0.8 A; 250 V; 5 × 20 mm fuse inserts must be used.

For the catalogue numbers of fuse inserts please see page 4-8 in section 4.2.4.



1 On/off switch
2 Fuse inserts
3 Fuse holder

Fig. 4-1 Changing the fuses



1 Cover
2 Halogen lamp

Fig. 4-2 Changing the 6 V, 20 W halogen lamp

4.2.2 Changing the 6 V, 20 W halogen lamp

Do not touch the lamp bulb with your bare hands; if required, clean the bulb with clean alcohol before switching it on for the first time to prevent dirt from burning in.

The following procedure is required to exchange the lamp:

- Switch off lamp supply via on/off switch and allow lamp to cool down for approx. 15 minutes.
- Disconnect the earth-contact plug from the line and remove the flat plug from the instrument connector.
- Place the disconnected instrument on its back to make the underside of the pyramid stand accessible.
- Fold down cover (4-2/**2**) and pull out defective halogen lamp (4-2/**1**).
- Use the protective cover to hold the new 6 V, 20 W halogen lamp and insert both lamp pins carefully into the receptacles.

The Axiostar microscope is supplied with factory-aligned illumination. The illumination need not be adjusted even when the lamp is exchanged by the customers themselves.

- Fold up cover again, return the stand to the upright position and reconnect the stand to the line.

4.2.3 Troubleshooting table

Problem	Cause	Remedy
Vignetting or inhomogeneous image brightness in the field of view; the field of view is not entirely visible	The vis/doc knob on the phototube is not in the correct position (intermediate position)	Move the vis/doc knob on the phototube to the correct position (end position), see p. 3-14, 3-16 and 3-18
	Nosepiece with objective not switched to stop position	Switch nosepiece with objective to stop position
	Condenser not set correctly	Set condenser correctly (adjustment, centering), see p. 3-4, 3-5
	Aperture diaphragm not set correctly	Set aperture diaphragm correctly (centering , opening), see p. 3-5
	Luminous field diaphragm not set correctly	Set luminous field diaphragm correctly (centering, opening), see p. 3-5
	Filter not inserted correctly in filter mount	Insert filter correctly in filter mount, see p. 3-3
Low resolving power and poor image contrast	Aperture diaphragm opening not set correctly	Set aperture diaphragm opening in accordance with the 2/3 rule or depending on the specimen features, see p. 3-5
	Condenser not focused correctly	Focus condenser, see p. 3-4, 3-5
	Wrong cover slip thickness for 0.17 transmitted-light objectives	Use the correct 0.17 mm cover slips, see p. 1-6
	Use of no or unspecified immersion oil with CZ immersion objectives	Use CZ immersion oil 518 N, see p. 4-8
	Air bubbles in the immersion oil	Remove air bubbles by applying new oil or by moving objective back and forth
	Immersion oil at the front lens of a dry objective	Clean the front lens of the dry objective, see p. 4-2
	Corr. ring is not set to the correct cover slip thickness	Set the corr. ring to the correct thickness, see p. 1-6

Problem	Cause	Remedy
	Dirt or dust on the optical surfaces of objectives, eyepieces, condensers or filters	Clean the appropriate components, see p. 4-2
Image aberration	Condenser not set correctly	Set condenser correctly, see p. 3-3, 3-4, 3-5
	Nosepiece not correctly switched to stop position	Correctly click-stop nosepiece
	Specimen is not fixed on the mechanical stage	Correctly set specimen in specimen holder and fix it
Great focus differences after objective change	Focusing eyepieces are not set correctly	Set focusing eyepieces to the appropriate ametropia, see p. 2-4, 2-5
Left and right fields of view cannot be combined into an image	Interpupillary distance of the binocular tube is not set correctly	Set interpupillary distance correctly, see p. 2-5
	Focusing eyepieces are not set correctly	Set focusing eyepieces to the appropriate ametropia, see p. 2-4, 2-5
Eye-fatiguing microscopy	Interpupillary distance of the binocular tube is not set correctly	Set correct interpupillary distance, see p. 2-5
	Focusing eyepieces are not set correctly	Set focusing eyepieces to the appropriate ametropia, see p. 2-4, 2-5
	Image brightness not acceptable	Reduce lamp voltage or insert conversion filter
Dirt or dust in the field of view	Condenser not focused correctly	Focus condenser, see p. 3-3, 3-4, 3-5
	Aperture diaphragm opening too small	Set aperture diaphragm opening in accordance with the 2/3 rule or depending on the specimen features, see p. 3-4
	Dirt or dust on the optical surfaces of objectives, eyepieces, condensers, filters or specimens	Clean the optical surfaces of the appropriate components, see p. 4-2
The 6 V, 20 W halogen lamp does not function although the on/off switch is in „on" position	Line cable not connected to the line	Connect line cable to the line and make sure to check the instrument and line voltage, see p. 2-12

Problem	Cause	Remedy
	6 V, 20 W halogen lamp not installed	Install 6 V, 20 W halogen lamp, see p. 4-4
	6 V, 20 W halogen lamp defective	Exchange 6 V, 20 W halogen lamp, see p. 4-4
	The specified 6 V, 20 W halogen lamp is not used	Use the specified 6 V, 20 W halogen lamp, see p. 4-8
	Defective fuses	Exchange fuses, see p. 4-3
	Electronics module possibly defective	Have electronics module checked by microscopy service and replaced, if required, see p. 4-9
The 6 V, 20 W halogen lamp flickers, unstable brightness	End of average life of 6 V, 20 W halogen lamp	Replace 6 V, 20 W halogen lamp, see p. 4-4
	Incorrectly installed or broken line cable	Correctly connect line cable or replace it, see p. 2-12
	The pins of the 6 V, 20 W halogen lamp are not correctly inserted into the receptacle	Correctly insert pins of 6 V, 20 halogen lamp into receptacle, see p. 4-4

4.2.4 Table of spares, wearing parts and tools

Description	Cat. No.	Application
6 V, 20 W long-life halogen lamp	380079-9690-000	for the integrated illumination of the Axiostar
SW 3 ball-headed screwdriver	000000-0069-551	for changing the phototube
SW 2 90°-offset hexagonal key		for attaching colored-disk condenser and swiveling polarizer
Eyepiece eyecup	444801-0000-000	recommended for techniques with a low brightness level in order to suppress light reflection
Dust cover for nosepiece Dust cover for eyepiece tube	462981-0000-000 000000-0168-373	for covering unused instrument openings
Immersol 518 N ; 20 ml oiler 100 ml bottle 250 ml bottle 500 ml bottle	 000000-1111-806 000000-1111-807 000000-1111-808 000000-1111-809	for applications using immersion oil
Cleaning paper, 300 sheets	462975-0000-000	for cleaning optical surfaces
Fuse inserts (5 × 20 mm) for all line voltages; T 0.8 A; 250 V	000000-0127-019	electrical overload protection for the integrated power supply
Light filters: Interference wide-band filter ,green, d = 32 × 4 Interference band filter, green 546, d = 32 × 3 CB 12 conversion filter, d = 32 × 2 CB 6 conversion filter, d = 32 × 2 CB 3 conversion filter, d = 32 × 2 3200-5500 K conversion filter, d = 32 × 2 N 0.25 neutral-density filter; d = 32 × 2 N 0.06 neutral-density filter; d = 32 × 2 0.50 gray filter, d = 32 × 4 0.12 gray filter, d = 32 × 4 0.03 gray filter, d = 32 × 4 KG 1 heat-protection filter, d = 32 × 2 Reflection heat protection filter, d = 32 × 2	 467803-0000-000 467807-0000-000 467850-9901-000 467851-0000-000 467852-0000-000 467847-0000-000 467849-0000-000 467848-0000-000 467840-0000-000 467841-0000-000 467842-0000-000 467830-0000-000 467832-0000-000	 for enhancing the contrast in b/w photography and phase contrast for color photography using daylight color films and artificial light color reversal films for observation and b/w photography with transmission information in % for photography without color distortion, with transmission information in % for protecting sensitive specimens from heat
Dust cover K Dust cover G (only in combination with binocular phototube)	459300-0000-000 459306-0000-000	for covering the instrument when it is not used

4.3 Requesting service

All repairs of mechanical, optical or electronic components inside the instrument and of the electrical components of the Axiostar may only be performed by Carl Zeiss service staff or specially **authorized** personnel.

To ensure the optimum setting and trouble-free function of your microscope over a longer period of time, we would recommend that you conclude a service/maintenance contract with Carl Zeiss.

In the case of subsequent orders or when service is required, please get in touch with your local Carl Zeiss agency.

Further information is also available in the Internet under the following address:

www.zeiss.de/micro

ANNEX

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List of Abbreviations

A-Plan	Achromatic objectives featuring improved image flatness (ICS line)
Br.	suitable for eyeglass wearers
CB	Correction Blue (conversion filter)
CCD	Charge Coupled Device
CE	EC conformity declaration
CP-Achromat	Achromatic objective (ICS line)
CSA	Canadian Standards Association
d	diameter
D	dark field or cover slip thickness
DIN	Deutsches Institut für Normung (German standards association)
doc	documentation
DX	coding system for the storage of electronically legible information, e. g. film speed
EG	European Community
EMV	electromagnetic compatibility
EN	European standards
ENG	"Electronic News Gathering"
E-PL	name of eyepiece type with aspheric lens and flat field of view
EWG	European Economic Community
foc.	focusing
HAL	halogen lamp
H	bright field
ICS	Infinity Color corrected System
IEC	International Electrotechnical Commission
IP	International Protection (protection type)
ISO	International Standard Organization
MC	Microscope Camera
N	neutral-density filter
Ph	phase contrast
PL	plan
R	right (control on the right of the mechanical stage)
SLR	Single Lens Reflex
SW	wrench opening
s/w	black-and-white
T	slow-blow (fuse type)
T2-Adapter	standard adapter for 35 mm cameras
V_{Obj}	magnification of the objective
VDE	association of German electrotechnicians
vis	visual
W 0,8	Whitworth-type thread (inch thread) 0.8"

Physical and Technical Units

A	ampere
°	angular degree
°C	Centigrade
h	hour
hPa	hectopascal
Hz	Hertz
K	Kelvin
kg	kilogram
lm	Lumen (light flux)
mm	millimeter
µm	micrometer
V	Volt
W	Watt
''	inch

TÜV CERT

CERTIFICATE

The TÜV CERT Certification Body of TÜV Anlagentechnik GmbH

Unternehmensgruppe TÜV Rheinland/Berlin-Brandenburg

certifies in accordance with TÜV CERT procedures that

Carl Zeiss Jena GmbH

D-07740 Jena

has established and applies a quality system for

Manufacturer of optical, electronic, medical and precision-mechanical products

An audit was performed,

Report No. **3071/8**

Proof has been furnished that the requirements according to

DIN EN ISO 9001:1994 and **DIN EN 46001**

are fulfilled. The certificate is valid until **February 2002**

Certificate Registration No. **09 105 3071/8**

This certificate does not represent proof that the statutory requirements of the German Medical Products Act or Directives 93/42/EEC or 90/385/EEC have been fulfilled.

Deutscher Akkreditierungs Rat
DAR
TGA-ZM-28-96-11

Cologne, 03.03.1999

TÜV Rheinland / Berlin-Brandenburg

TÜV

TÜV CERT Certification Body of TÜV Anlagentechnik GmbH

EG-Konformitätserklärung
EC Declaration of Conformity

Qualitätsmanagementsystem zertifiziert nach/Quality Management System certified to meet:
DIN EN ISO 9001, EN 46001

Wir erklären hiermit die Übereinstimmung des genannten Gerätes mit der EG-Richtlinie 73/23/EWG – Niederspannungsrichtlinie einschließlich der Änderung 93/68/EWG und mit der Richtlinie 89/336/EWG über die Elektromagnetische Verträglichkeit einschließlich der Änderungen 92/31/EWG und 93/68/EWG.
Bei Änderungen am Produkt, die nicht von uns autorisiert wurden, verliert diese Erklärung ihre Gültigkeit.

We declare the compliance of the device with the requirements of the Council Directive 73/23/EEC – Low Voltage Directive including modification 93/68/EEC and with Council Directive 89/336/EEC about the Electromagnetic Compatibility including modifications 92/31/EEC and 93/68/EEC
Any modification to the product, not authorized by us, will invalidate this declaration.

Gerätebezeichnung/Device name:

Mikroskop Axiostar
und Zubehör

Normen/Standards:

EN 55011	Grenzwerte u. Methoden für Funkstörungen von ISM-Geräten
EN 50082-2	Elektromagnetische Verträglichkeit - Störfestigkeit
EN 61010-1	Sicherheitsbestimmungen für elektrische Meß-, Steuer-, Regel-und Laborgeräte

Grundlage - Konformitätsakte Nr./Basis –Record of Conformity No.: MI 034/99

Das Gerät ist gekennzeichnet mit/ The device is marked with CE

Prüfung/Test: **EMV-und GS-Labor Servicebereich Qualität / EMC- and Product Safety Laboratory Service Department of Quality Carl Zeiss Jena**

Registriert/Registered: CZG **MICE 005-00**

Göttingen, 29.02.00

Carl Zeiss Werk Göttingen

Dr. Gorny

Geschäftsbereich Lichtmikroskopie
Business Group Light Microscopy

Heinrich

Qualitätsmanagement
Quality Management

Die Erklärung bescheinigt die Übereinstimmung mit der Richtlinie und dem Gesetz. Gewährleistung und Haftung sind in unseren Allgemeinen Lieferbedingungen geregelt.

The declaration certifies the compliance with the Directive and the Law. Conditions of guarantee and liability are dealt within our General Conditions of Sale.